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*"A COMPLETE PHYSICAL THERAPY SERVICE TO THE PROFESSION"*

# SELECTIVE HEAT PRODUCTION BY ULTRASHORT (HERTZIAN) WAVES *

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University of Illinois College of Medicine

CHICAGO

Several authors[1, 2] have reported a selective heat production of ultrashort waves according to the equation

$$\lambda = \frac{\epsilon \cdot c}{\epsilon \kappa}$$

where $\lambda$ is the wavelength producing maximal heat, $\epsilon$ represents the dielectric constant, $\kappa$ the electric conductivity of the substance, and c the velocity of light. According to this formula there is an optimal wavelength for heat production in any material, depending upon its dielectric constant and electrical conductivity. Experimental data obtained on inorganic substances and on biological tissues demonstrate the existence of a selective heat production.

Recently a number of papers in the American literature also discussed this problem. Krusen[3] doubts the correctness of Schliephake's claims *in toto*, but presents no new experimental data to substantiate his criticism.

Mortimer and Osborne[4] report extensive experimental work — *in vivo* and *in vitro* — on the problems of the "penetration of heat into the body," selective thermal action, specific biologic and bactericidal action. The authors find no evidence "that short wave diathermy possesses a more uniform penetration of heat into the body than the conventional diathermy." They consider "the possibility of special selective thermal action a very remote one." They are not "able to substantiate the claim of specific biologic action of short wave diathermy." They believe, however, that the claims of specific bactericidal action can be explained on the basis of "point heating" of the micro-organisms to a higher temperature than that of the medium.

Gale[5] has studied the "penetrative and selective heat effects of short and ultrashort waves." In this work, the two problems of selective heat production of various substances under otherwise identical experimental conditions, and of the heat distribution produced in a homogeneous medium, have not been separated. Therefore nothing further can be concluded than that "short and ultrashort waves have the power of ***selective heat penetration***" and that "the cross sectional area of a substance plays an important rôle in its heating reaction — ." The destructive effects on paramecium and chilomonas is attributed to the heat effect.

In a paper, "Short Wave Therapy," by Turrell[6] the "theory of selectivity" is tied up with the permeability of all membranes to high frequency currents and the field distribution in a homogeneous tissue. The claim that certain wavelengths may have "specific selective properties for certain cells" is disposed of by a comparison with the "famous Schearer War Hoax."

It is evident that conclusions arrived at in these papers leave the problem of selective heat production by ultrashort waves unsettled. The following investigation was conducted for the purpose of deciding whether or not ultrashort waves produce selective heating in different biological substances. The problems of field distribution, conduction and convection of heat in the dead or live body are not considered here, in order to prevent clouding of the issue.

Before the problem of selective heat production could be studied experimentally, it was deemed necessary to examine the effect of the position of several objects in the condenser field. In case of high frequency currents it makes a great difference whether two objects with different resistances are in parallel or in series. In the first case, the potential difference in both objects is the same, but the object with lower resistance will conduct most of the current and will be heated most. In the second case the same current will go through both objects, but at a greater potential difference in the object with higher resistance, and that one will be more heated. In the case of hertzian waves, conditions are so different from electric currents that it was necessary to

* Read at the Fourteenth Annual Session of the American Congress of Physical Therapy, Kansas City, Missouri, September 11, 1935.

study the influence of the relative position of two objects in the field.

Figure 1 illustrates the two positions used.

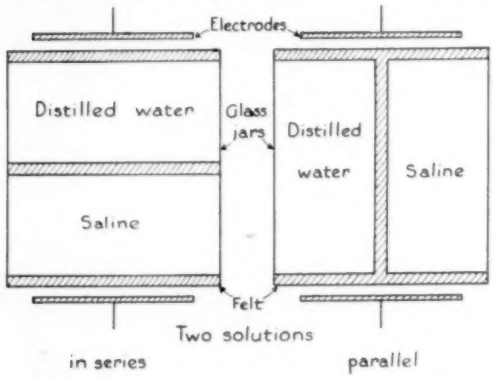


Fig. 1. — Two solutions in series, and parallel.

Two glass jars (5 x 4 x 2 inches) were employed, one filled with distilled water, one with saline solution. A piece of felt was used to insulate one from the other jar, and the jars from the electrodes, to prevent heat conduction. A 7 m. wave was applied. In both positions the saline heated up ten times as much as the distilled water. Neither did a reversal of the two vessels in the series arrangement between the two electrodes alter the result. Since the series arrangement appeared less sensitive to the position of the electrodes, experiments with different wavelengths were made in this setting. Table 1 gives the averages of the observations:

TABLE 1. — *Averages of Observations*

| λ (m) | dt water (c°) | dt saline (c°) | dt saline / dt water |
|---|---|---|---|
| 3.5 | + .2 | +7.4 | 37 |
| 4.5 | .1 | 2.9 | 29 |
| 5.5 | .4 | 6.8 | 17 |
| 7.0 | .5 | 5.1 | 10 |
| 15.0 | 3.3 | 3.7 | 1.1 |

(dt = temperature increase)

While the 15 m. wave heats both liquids at about the same rate, a selective heat production occurs with shorter waves in favor of the saline solution and increases with declining wavelength until with 3.5 m. the saline heats 37 times as much as the water. This relationship is illustrated in figure 2.

In order to study the selective heating of many substances under strictly identical physical conditions, the following arrangement was designed: The vertical metal rod of a kymograph was extended by a hard rubber rod, and on the upper end a round cardboard

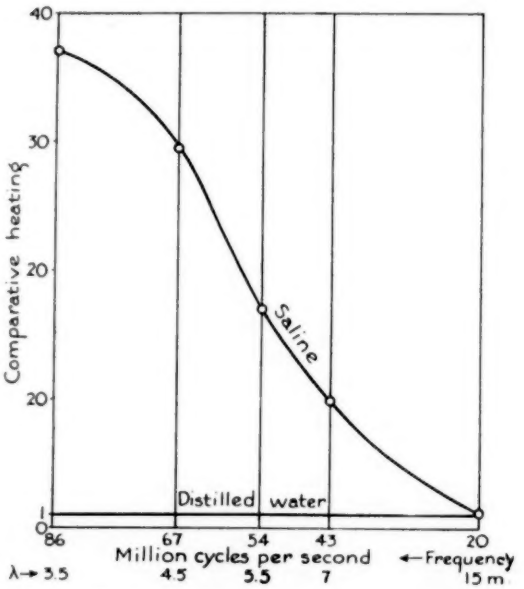


Fig. 2. — Heating of saline and distilled water through different wavelengths of ultrashort waves.

disc with 6 holes was fastened, in which 6 test tubes were held. Various electrolytes and body fluids or tissues could be placed in these tubes, and an alcohol thermometer, graded in fifths of a degree, could be inserted. This apparatus rotated between two condenser plates of 5 x 7 inches, at a speed low enough to allow temperature readings. By this arrangement a comparative study of six substances could be made in a short time. Temperature readings were made over ten to thirty minutes by inserting the thermometer for one minute in the alternate tubes, and the temperatures were interpolated for the times between the readings. The temperature time curves appeared straight over a certain range, but the steeper curves showed a tendency to flatten out after several minutes, indicating heat loss by air convection and heat radiation, while the flatter curves tended to bend upwards, suggesting indirect heating from the hotter tubes. Only points along the straight part of the curves were used for the evaluation of the results. Figure 3 illustrates a typical experiment. The following six substances were used:

| Substance | Spec. Res. ohm . cm. | 1 / ohm . cm. | Conductivity |
|---|---|---|---|
| Distilled water | 220,000 | | .0000045 |
| Coll. gold-solution { dialized | 10,300 | | .000097 |
| Coll. gold-solution { undialized | 1,240 | .00081 | |
| Gelatin | 250 | | .0040 |
| ½ physiologic saline | 180 | .0055 | |
| Physiologic saline | 71 | | .014 |

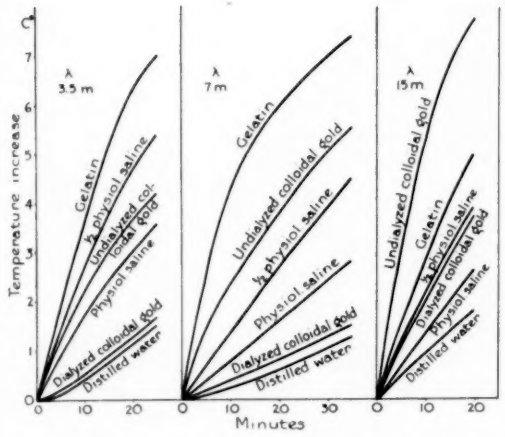


Fig. 3. — Observed temperature increase for different inorganic substances and various wavelengths of ultrashort waves.

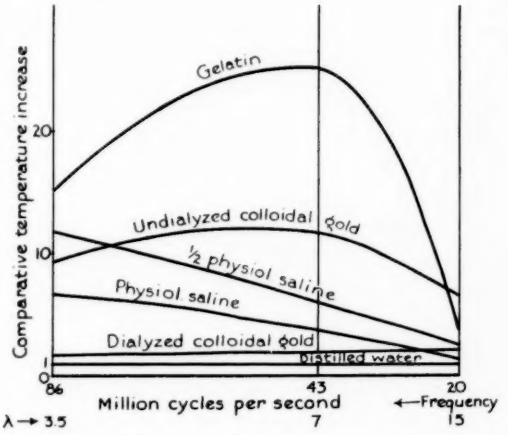


Fig. 4. — Selective heating of various electrolytes.

Equal volumes of these substances were exposed to the field of 3.5, 7, 15 meter wavelengths. The intensities were regulated so as to produce similar heating in the average; the exposure times were chosen so as to correct for still existing temperature differences. In spite of all this, decided differences occur for the various wavelengths, proving selective heating. Gelatin, for example, is predominantly affected by the 7 m. wave; undialized gold more by the 15 m. wave. The greatest differences in heating occur at the 3.5 and 7 m. waves, even to a degree that the distilled water and the dialized gold solution were indirectly heated by the hotter tubes.

In order to eliminate the influence of the variation of energy output in the field from one to another wavelength, all figures can be referred to one standard, for instance, the heating of distilled water. For the preparation of figure 4 the heat values at 5 minutes exposure have been selected, as representing the part of the curve which is not influenced by heat conductivity. In this curve (and the following ones) the abscissa is subdivided from the right to the left into frequency figures, and the corresponding wavelength figures are indicated below. The ordinate represents the ratio of the heating of each substance to that of water. Therefore, the water figures appear always as unity. Although the data are too incomplete for the exact determination of the shape and the position of the maxima of the curves, it is evident that for gelatin and the undialized colloidal gold solution wavelengths around 7 and 15 m. are optimal, while for the other substances wavelengths of less than 3.5 and more than 15 m would be desirable for maximum heating.

## Tissues Studied

In a similar way the following body tissues were studied: human skin (white, colored), (normal, cleaned); subcutaneous fat; mesenteric fat; muscle; spleen; liver; brain; lungs; bone (femur, vertebra); bone marrow; hair.

For the comparison of these biological materials with one another the skin was selected as a standard rather than distilled water as before. This was done for two reasons:

1. The heating of distilled water was very slight and was influenced by the nearby heated tubes.

2. The ratio of the heating of these tissues to the heating of the skin is of greater biological importance, since it is one of the factors which determine the heat distribution in the body.

Figure 5 is characteristic of the experimental findings.

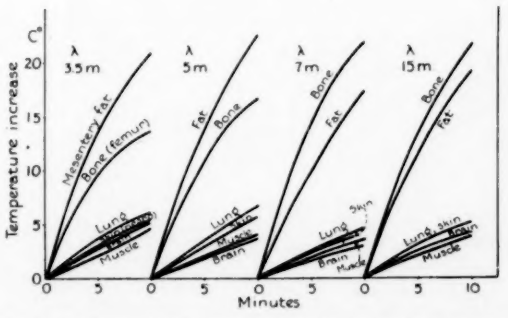


Fig. 5. — Observed temperature increase for various organic substances and various wavelengths of ultrashort waves.

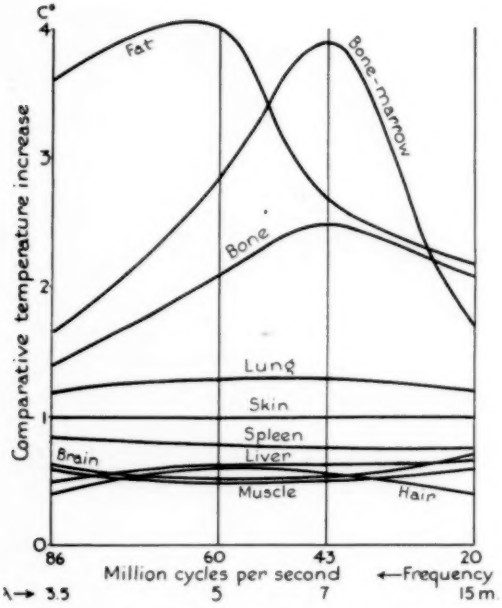


Fig. 6. — Selective heating of biological tissues.

The results are completed, averaged and compiled in figure 6.

Every curve represents the average of measurements on 2 to 6 specimens. As a rule each individual curve had sharper and more extreme maxima, sometimes at different wavelengths for the same or similar material. In some cases the individual curves were still ascending at the shortest or longest wavelength, indicating that the optimal wavelength fell outside the range studied.

The various tissues can be subdivided in two groups in their heating relation to the skin: Spleen, liver, muscle, brain and hair heat less than the skin; also skin well cleaned of fat and grease by boiling in ether, heated somewhat less than normal skin, from which the adipose layers were mechanically removed. On the other hand, lungs, bone marrow, fat and bone were heated much more than the skin. These observations may lead to the following conclusions:

1. Hair and fur on the skin will not increase the heating of the skin by these waves unless local heating occurs through the shafts of the hair.

2. The subcutaneous tissue is heated considerably more than the skin and will indirectly heat up the skin by conduction and convection.

3. Internal structures such as muscles, spleen, liver, brain, are primarily heated less than the skin. They may be heated secondarily from adjacent structures, which are more selectively heated, such as bone.

4. While the lungs cannot be heated by high frequency currents, due to their position and great resistance, they manifest selective heating in the hertzian wave field.

5. The bones are also heated selectively; for these experiments parts of the vertebrae and femur were used. The spinal cord and the bone marrow were removed. The thermometer was inserted into the cavity and the lower end closed by a cork. To test whether organic substances were responsible for this selective heating, the bones were boiled in water and tested again. The specific heating was not markedly altered by this procedure.

6. The strongest heating was observed in fat (mesenteric and subcutaneous) and in the bone marrow. The most pronounced heating of these substances occurred around the 6 m. wave (5 and 7 m.).

The observations by Pratt and Sheard,[9] that the knee joint of a live dog can be heated to a higher temperature than the superficial tissues of the exposed region, must be due to the selective heating of bone, cartilage and fat, to such an extent that tissue conduction and blood convection are unable to equalize the temperatures in the tissues in question.

These results, obtained under well defined physical conditions, substantiate in principle the results obtained by Schliephake under conditions less well defined. In detail, however, rather pronounced differences were noticeable. Such a strong relative heating of the liver as was claimed by Schliephake could not be observed by the author.

The selective heating of the blood and its constituents, the blood serum and the blood corpuscles, was studied in the same way and compared with human skin. The results are given in figure 7. Blood is heated about one-half as much as skin. The serum is heated 25 to 40 per cent less, and the corpuscles 10 to 45 per cent more than the whole blood; the actual heating of the whole blood is, therefore, the result of the direct heating of its two components.

In a similar way the heating of bacteria (B. prodigiosus) and yeast (sac. cerevisiae) was studied in comparison with the fluids from which they were centrifuged; this was the

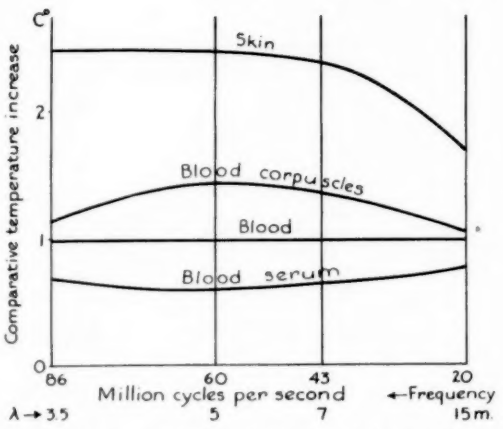


Fig. 7. — Selective heating of blood and its constituents.

broth in case of the bacteria, and the fluid in which the yeast was washed. The heating of these suspension fluids is arbitrarily set as unity for all wavelengths; thus the figures for bacteria and yeast give the heating in ratio to their respective suspension fluids. Figure 8 indicates that for most of the waves used the organisms were heated less than their suspension fluids. In case of yeast the ratio is reversed between 5 and 3.5 m. wavelengths; in case of the bacteria the reversal seems to occur at a wavelength shorter than 3.5 m.

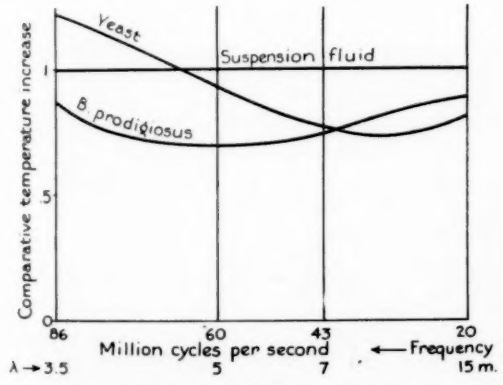


Fig. 8. — Selective heating of bacteria, yeast and their respective suspension fluids.

This experiment appears to show that a selective bactericidal effect of the high frequency waves is improbable. While several authors[8] have claimed that bacteria are killed in the high frequency field at a temperature which normally does not destroy them, other investigators[9] could not substantiate these findings.

Two kinds of experiments were designed for the purpose of studying the effect of the high frequency field on bacteria.

1. Two test tubes contained the bacterial (B. prodigiosus) suspension, one in distilled water, one in physiologic saline solution. Each tube contained a mercury thermometer graded in 1/5 degrees C. and was held in the center of a museum glass jar containing water of 40 degrees C. The jar was exposed to the ultrashort wave field for one hour, the intensity of the field was regulated so as to avoid an increase of the temperature of the bacterial suspension to more than 44 degrees C. The 3.5, 5, 7 and 15 m. wavelength was used. An identical jar was held at the same temperature by means of a water bath and a Bunsen burner, outside of the ultrashort wave field. Just before and after the one hour exposure a plate was made on which the bacterial population was later counted. The quotient of the resulting figures gave the growth rate of the bacteria per hour. The quotient: Growth rate of the control divided by growth rate of the exposed bacteria represents the bactericidal effect of the ultrashort wave field in relation to the normal behavior of the cultures, 1 indicating no noticeable effect, >1 indicating destructive effect of short wave, <1 indicating stronger growth than normal.

2. A similar experiment was conducted with a cooling system to keep the temperatures far away from destructive temperatures, close to 30 degrees C. Only saline suspensions were used. Table 2 gives the results of all these experiments.

At first glance the resultant figures seem to be scattered at random between 0 and 4, indicating no significant inhibitory or growth promoting effect. It is peculiar, however, that all the saline figures are decidedly higher than the corresponding figures for water. This seemed to correspond with the observation that during full exposure the saline heated up more than the water, with a difference of about ½ degree C., in the field; in most of the experiments the control was kept at the average of these temperatures. In order to decide upon the influence of this factor a different experiment (table 2) was conducted with the 7 m. wave, in which the water and the saline suspension were studied separately at exactly identical temperatures. Again there was a difference between the saline and the water figures in the same direction, al-

TABLE 2. — *Results of All Experiments*

| | Exp. | λ (m) | Media | —Ultrashort waves— Bef'e | After | Gr-rate | ——Control—— Bef'e | After | Gr-rate | Control U. Sh. W. |
|---|---|---|---|---|---|---|---|---|---|---|
| Bacteria Exp. Type I (high T°) $H_2O$, Saline. No cooling. | | 3.5 | $H_2O$ | 176 | 106 | .60 | 140 | 97 | .69 | 1.1 |
| | | | Sal. | 138 | 115 | .83 | 124 | 126 | 1.02 | 1.2 |
| | | 4.5 | $H_2O$ | 405 | 390 | .96 | 411 | 0 | 0 | 0. |
| | | | Sal. | 544 | 594 | 1.08 | 324 | 591 | 1.82 | 1.7 |
| | | 4.5 | $H_2O$ | 152 | 51 | .35 | 183 | 0 | 0 | 0. |
| | | | Sal. | 135 | 43 | .32 | 160 | 54 | .35 | 1.1 |
| | | 5.0 | $H_2O$ | 120 | 75 | .63 | 107 | 40 | .37 | .6 |
| | | | Sal. | 231 | 94 | .40 | 115 | 97 | .84 | 2.1 |
| | | 7.0 | $H_2O$ | 104 | 8 | .08 | 171 | 16 | .09 | 1.1 |
| | | | Sal. | 146 | 41 | .28 | 120 | 138 | 1.15 | 4.1 |
| | * | 7.0 | $H_2O$ | 171 | 118 | .69 | 414 | 77 | .19 | .3 |
| | | | Sal. | 315 | 506 | 1.6 | 480 | 469 | .97 | .6 |
| | | 15. | $H_2O$ | 121 | 27 | .22 | 88 | 4 | .04 | .2 |
| | | | Sal. | 129 | 99 | .77 | 114 | 143 | 1.24 | 1.6 |
| | Avge | | $H_2O$ | | | | | | | .5 |
| | Avge | | Sal. | | | | | | | 1.8 |
| Bacteria Exp. Type II (low T°) Saline. Cooling. | | 3.5 | Sal. | 520 | 350 | .67 | 460 | 450 | .97 | 1.4 |
| | | | | 204 | 165 | .80 | 189 | 170 | .90 | 1.1 |
| | | 5.0 | Sal. | 120 | 106 | .88 | 166 | 149 | .90 | 1.0 |
| | | 7.0 | Sal. | 82 | 92 | 1.11 | 98 | 79 | .81 | .7 |
| | | | | 96 | 104 | 1.08 | 123 | 81 | .66 | .6 |
| | | 15. | Sal. | 191 | 148 | .78 | 216 | 124 | .57 | .7 |
| | Avge | | Sal. | | | | | | | .9 |

though not so pronounced as in the original experiment.

In the experiment at lower temperatures it seems that at the shorter wavelength a destructive effect takes place, that is not present with the longer wavelengths. All these bacteriological results should be regarded as preliminary. Further studies are required for the final settlement of these questions.

## Summary

1. Identical results were obtained when two objects with different conductivities were exposed to ultrashort waves, once in series, once in a parallel circuit.

2. Different heating was observed if electrolytes of different conductivities and various biological materials were exposed to ultrashort waves under strictly identical conditions as to volume, shape, position, wavelength, intensity and time.

3. The wavelength at which maximal heating occurred was different for the various materials.

4. The ratio of heating of the various materials was different for various wavelengths.

5. For a 5 m. wave the relative heating in descending order is: fat, bone marrow, bone, lung, skin, spleen, liver, hair, brain, muscle. Blood corpuscles are heated more, blood serum is heated less than whole blood.

6. The results obtained upon selective heating and destruction of bacteria and yeast by ultrashort waves are not yet conclusive.*

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* This investigation was conducted on the Ultra Pandoros apparatus of the Adlanco X-Ray Corp., New York. The author wishes to thank the Company for making it possible to use this machine, and for their technical assistance.

# THE TREATMENT OF ACNE VULGARIS *

## (With Special Reference to Physical Therapy)

ERWIN P. ZEISLER, M.D.

CHICAGO

Physical therapy, particularly roentgentherapy, has for several decades played a conspicuous part in the therapeutic management of acne vulgaris and the literature shows alternating periods of enthusiasm and skepticism. That the profession and the public are still not entirely satisfied with the results of this relatively simple method of treatment, is indicated by continued investigation of the underlying etiologic factors, the periodic introduction of newer therapeutic methods, and the advocacy by many authors of combined methods of treatment. There are at present two divergent schools of thought respecting the etiology of acne vulgaris. One, based on the work of Unna, Sabouraud, Gilchrist and Engman, considers the disease to be a local bacterial process with the acne bacillus as the causative factor and the staphylococcus as a secondary invader. The other regards acne as a symptom complex or syndrome due to a variety of metabolic, gastrointestinal and endocrine disturbances — occurring during the adolescent period of life. The probability is that both views are correct. The characteristic pathologic changes in acne — the sebaceous hypertrophy, the follicular hyperkeratosis with plugging of the enlarged ducts and perifolliculitis — can best be explained by the local action of the acne bacillus with the staphylococcus contributing to the pustulation; while the hypersecretion of the oil glands, which furnishes the soil for the activity of the acne bacillus, can be correlated with the associated systemic conditions.

### Evaluation of Causative Factors

Every case of acne vulgaris should be given a thorough systemic examination in order to detect all possible contributory factors. If necessary the services of the gastroenterologist should be enlisted for a chemical and roentgenologic study of the gastric and intestinal functions. The endocrinologic aspect in all cases should receive careful investigation. Before deciding on the method of therapy to be employed, each case should be carefully appraised and consideration should be given to the patient's age, type of acne, the dietary factors, the presence of associated systemic conditions and any previous treatment. It is improper to employ routine measures in the treatment of acne vulgaris and to subject every patient to a long course of physical therapy not justified by existing conditions or by the results to be expected.

In discussing the different types of acne we still adhere to the well recognized definition of acne vulgaris as a chronic inflammatory disease of the sebaceous glands of the face, chest and back in which the presence of comedones and excessive oiliness of the skin are distinctive clinical features. In severe cases the predominance of papular and pustular lesions and more deeply seated infiltrates, abscesses and cysts produces different clinical varieties described in the text books under various names. We omit consideration of the occupational varieties of acne produced by contact with tar, paraffins, wax, oils and greases, and the types produced by ingestion of drugs such as bromides and iodides, which properly belong to the group of drug eruptions. We also recognize special types of acne occurring in tuberculous and cachectic individuals, some of which belong to the acneiform tuberculids and others to the so-called acne conglobata. Another variety called acne varioliformis occurs usually after the age of 30, affects the forehead chiefly and is due primarily to staphylococcus infection.

We shall not attempt to discuss the many perplexing questions relative to the etiology of acne, nor to cover all the recent literature, as that has recently been done in the excellent paper by Michael.[1] Our purpose is to present an evaluation of the merits of various forms of physical therapy we

* Read at the Fourteenth Annual Session of the American Congress of Physical Therapy, Kansas City, Missouri, September 11, 1935.

have employed in several thousand cases of acne over a period of twenty years, and to discuss their rôle in relation to other methods of local, dietetic and systemic treatment.

### Roentgen Therapy

Roentgen therapy has been used in the treatment of acne for a time that may be roughly divided into two periods. The first prior to 1917, made use of static machines, coils and gas tubes when estimation of dosage was difficult even when pastilles were used. The second dates since 1917, when MacKee[2] introduced the method of indirect measurement utilizing the Coolidge tube and interrupterless transformers and advocated a dosage of one-quarter of a skin unit unfiltered, once weekly. The earlier technic while inaccurate and unscientific was developed to a high point of efficiency by many of the older dermatologists who became expert in the use of the "softer" roentgen rays and obtained excellent results. Having used the older method of bi-weekly broken doses in many hundreds of cases of acne in the practice of the late Joseph Zeisler and myself, I can attest to its effectiveness and safety. Since employing the technic of MacKee, which has the advantage of accuracy of dosage, my results have not compared favorably with those previously obtained and I have not been able to duplicate the previous high percentage of cures. While I am not prepared to present accurate statistics, I doubt whether I have been able to secure more than 60 to 70 per cent of satisfactory results in my own practice with the MacKee technic when relying chiefly on x-rays. I might quote in this connection the *mot* of Dr. William Allan Pusey, who after he had made the change to modern equipment, stated that it was for the benefit of his office rather than his patients. Many of the older dermatologists have related to me the same experience, namely, their failure to obtain satisfactory results in their acne cases with the present method of fractional dosage.

Many authors following MacKee's lead have presented statistics of their results in acne, showing up to 90 per cent of cures with a single series of unfiltered treatment of ¼ skin unit — or 75 roentgens — given once weekly over a three or four month period. The statistics of Fox,[3] Michael,[4] Remer and Witherbee,[5] Lord and Kemp,[6] Hazen and Eichenlaub,[7] agree in a general way on the high percentage of curative results but also admit as high as 25 per cent of relapses. Most dermatologists have carried on the weekly treatments until at least a total of 2¼ skin units have been administered, but it is generally agreed that from 12 to 15 treatments are needed for permanent results. Lord and Kemp found paradoxically that the less x-ray treatment necessary to effect complete eradication of the lesions the more likelihood there was of a permanent cure.

An important question that is not discussed by most of these authors is, whether the condition of the skin at the end of the course of Roentgen therapy is better than in those cured without it. Here we must recall the drying effect of the x-rays on the skin, the temporary development of ephelids or pigmentation, and the important question of the effect of x-rays on the scarring and pitting that is inevitable in many of the more deeply seated varieties of acne. To illustrate the diversity of opinion on one of these questions, I mention MacKee's contention that scarring and pitting are minimized and can be prevented by the early use of roentgen rays; on the other hand Schamberg felt that pitting might be more marked in cases treated by x-rays. Similarly MacKee states that he has never seen telangiectasia in over 2,000 cases of acne, and he doubts whether without an erythema it is possible for telangiectasia to develop. Hazen, however, has reported a number of cases in which this complication occurred several years after treatment was completed and in which there had been no preëxisting erythema.

Another important question is whether we should favor the routine use of x-rays in juvenile cases of acne, in mild cases with a dry skin and only a few comedones, or whether we should reserve the x-rays only for the more deeply seated cases, particularly those of acne indurata in which routine dermatologic management is usually futile and roentgen treatment the only method of securing permanent results. Most of us will agree with Michael that the x-ray should not be used routinely in individuals under 18 years of age on account of the high percentage of recurrences. The

same rule should also apply to the recurring types of menstrual acne and those following ingestion of certain foods.

We may summarize the situation by saying that x-rays should not be used indiscriminately in all cases of acne, that they should not be administered in early adolescents, and that we should recognize that many cases can be cured by proper hygiene combined with constitutional and topical treatment without the use of x-rays. Furthermore, while recognizing that the roentgen ray is a valuable agent in the treatment of many types of acne we would recommend that the dosage and the number of treatments be reduced to the minimum necessary to achieve permanent results. For some time it has been our practice to use dosages more nearly approximating ⅛ skin unit (35-40 roentgens) weekly and after a short series of treatments, usually 4 to 6, to substitute irradiation with ultraviolet light and to combine this with vaccine therapy and indicated systemic treatment. Our results have definitely improved by this combined treatment. With this régime it is seldom necessary to continue treatment longer that 3 or 4 months and our percentage of relapses has been less than with other methods.

The combination of x-rays with local medication is favored by a few authors although MacKee has stressed the necessity for caution in the use of such local stimulating agents as mercury and sulphur. Eller[8] found that his results with x-rays were improved by using a heavy white lotion of zinc sulphate two ounces, potassium sulphate one and one-half ounces, glycerine one dram and rose water one dram. He found that most cases of acne were cured in 12 treatments with fractional doses of x-rays (¼ skin unit weekly) in combination with the heavy white lotion. Lord and Kemp used an astringent sulphur lotion together with x-rays and at times noted a mild degree of erythema after the fourth or fifth week. We have for some time used a modified lotio alba combined into a calamine lotion with satisfactory results. In general most authors feel that during roentgen therapy only soap and water should be used, that greasy applications and massage should be avoided, and that individual lesions should be evacuated with a fine iridectomy knife and comedones expressed with suitable instruments.

### Ultraviolet Light

The effect of ultraviolet light upon acne has received considerable discussion. There is no doubt that ultraviolet radiation both general and local, has been greatly overdone and instances of harmful effects have occasionally been cited. The disadvantages of actinotherapy may be summarized as follows: 1. It may require an erythema dose and desquamation to produce favorable effects upon the cutaneous eruption; an erythema is objectionable to many patients. 2. It is slower and less certain in its effect than the roentgen ray. 3. It does not improve the texture of the unaffected skin. 4. It may cause mild stimulation of hair growth. 5. When used alone without supporting treatment it will seldom cure an acne. 6. It is probably not as valuable as direct sunlight. 7. Its usefulness is limited to the superficial types of acne. In indurated and cystic acne its effect is distinctly inferior to that of x-ray.

The advantages of ultraviolet irradiation as compared with roentgen rays may be summarized as follows: 1. When used over a prolonged period it is far safer than x-ray and can be administered without fear in relapsing cases. 2. It can be combined with topical stimulating and antiseptic treatment. 3. In large doses it is of definite value in the residual scarring and pitting, as emphasized by Eller, Andrews and others. 4. The absence of possible late sequelae and freedom from late complications are important advantages over roentgen therapy.

Our own experience with ultraviolet irradiation covers many hundreds of cases. We have employed the air-cooled lamp with moderate success in acne of the back, chest and shoulders. We have employed generalized irradiation for its tonic effect in combination with x-rays to the face. In most cases of facial acne we have favored irradiation with the water-cooled Kromayer lamp in suberythema doses. We have found that the effect of ultraviolet light is enhanced by a preliminary topical application of a 2 per cent solution of iodine in chemically pure benzol. This has the advantage over tincture of iodine in that the skin remains stained for only a few min-

utes. In more deeply seated nodular and pustular lesions we advocate painting the lesions with Cutler's solution (equal parts of tincture of iodine, phenol and chloral hydrate) before irradiation. A mild solution of lotio alba or a Kummerfeld lotion at night may be advantageously combined with this treatment. Some authors prefer dabbing on a freshly prepared solution of sulphurated lime (Vleminckx's solution) in a dilution of 10 cc. to 150 cc. of water and increased in strength, if necessary, until slight chapping is produced. Stronger ointments of sulphur and resorcinol and "peeling" ointments are not advisable when using ultraviolet light.

We have also noted that our results with ultraviolet light therapy are more rapid and better when it is preceded by a short series of x-ray treatments, usually 4 to 6 doses of ⅛ to ¼ skin unit. We do not advocate the conjoint or alternate use of x-ray and ultraviolet, as some have, but our experience in several hundred cases has led us to favor the combined treatment as outlined. We have had the impression that our cosmetic results have been better than when x-ray alone is employed.

The literature contains many conflicting opinions as to the value of ultraviolet light therapy in acne. Michael, Stokes, Fox and others have been unsuccessful in its use. Butler, Eller, Andrews, Wise and many others, while recognizing its inferiority to x-ray in many types of acne, have had satisfactory results.

### Treatment of Associated Conditions

It may be accepted as an established fact that there are no specific remedies for acne and that internal treatment should be determined by the presence of associated or contributory factors, such as constipation, menstrual irregularities, anemia and endocrine dysfunction. We have for many years obtained encouraging results with a combination of ergot, cascara and an iron preparation which appears to meet most of these indications. Schamberg recommends whole adrenal gland in 2 grain doses and we have found this of value in cases with menstrual disturbances. Thyroid extract in small doses is occasionally of value. Evidence of the beneficial effect of yeast preparations is not conclusive. Other remedies that have been suggested are vitamin D, calcium chloride intravenously (5-10 cc. of a 10 per cent solution), (Bloom), sodium chloride (Sulzberger, Goodman), iron and arsenic, quinine, and ichthyol.

Relief of constipation and intestinal fermentation in the management of acne has been stressed for generations in text books. Yet neither Bloch[9] nor Cunningham and Lunsford[10] from a study of a large series of cases were able to reach the conclusion that constipation was responsible for the disorder in young individuals, or that it had any appreciable bearing on its incidence. Strickler[11] attempted to prove the intestinal origin of the disease by comparing the fermentation properties and indol production of the bacterial flora of the feces in acne patients with those of normal individuals, and his results suggested that the activating factor in a certain percentage of cases was either the colon bacillus or its toxins or in a lesser degree the staphylococcus. This author, however, expresses the opinion that acne, while a complex disease, is in the majority of cases due to the acne bacillus. Ketron and King's[12] study of the gastrointestinal tract did not show a higher incidence of abnormalities than occurs in normal individuals.

The recent literature on female sex hormone disturbances in acne has been thoroughly reviewed by Michael and Van Studdiford.[13] The age incidence of acne during and following puberty, the frequent exacerbations at the time of menstruation, and improvement in many individuals following establishment of normal marital relations strongly suggest a disturbed function of the sex glands or some endocrine imbalance. Yet Cunningham and Lunsford in a large series of women students at the University of California were uable to correlate the presence or absence of acne in the 15 to 34 year age group with menstrual irregularities. Similar observations were made by Bloch in the juvenile age group. The newer methods of detecting estrogenic substances in the urine have also been employed in the study of acne, but from a clinical standpoint female sex hormone therapy has been disappointing. Recently, however, Lawrence and Feigenbaum[14] noted encouraging results in 8 out of 14 cases of acne with antuitrin-s in doses of 1 to 2 cc. three times weekly (100 rat units).

In menorrhagia and metrorrhagia improvement in the acne paralleled the return of menstruation to normal. Much more clinical experience is required before it can be determined whether the recently introduced estrogenic and gonadotropic preparations are of benefit in acne vulgaris.

### Vaccines and Non-Specific Therapy

The literature on vaccine therapy in acne was admirably covered by Howard Fox.[3] There has been very little research done since then, and the following opinion expressed at that time still holds good today:

> The introduction of vaccine therapy in acne occasioned considerable enthusiasm for a period of years. After an extensive clinical trial the majority of dermatologists have either wholly or partly given up its use. Good results have undoubtedly been obtained by a few investigators after patient efforts with a special technic. In the hands of the majority the results in general have been unsatisfactory. The weight of opinion is that mixed vaccines (of both acne bacillus and staphylococcus) are of more value than those of acne bacillus alone. Stock and autogenous vaccines are considered by the majority to be equally effective. Whatever value these vaccines may possess is restricted to their use in selected cases, chiefly of the pustular type, or as an adjuvant to other methods of treatment. The action of vaccines is slow and improvement is often temporary. In the treatment of acne vulgaris the roentgen ray is far superior to vaccines.

We have during the past few years in a series of 150 cases of acne given injections of an acne bacillus suspension, prepared according to Engman's method and containing 30,000,000 bacteria to the cubic centimeter. An initial dose of three million is followed by doses of 5 to 10 million at five to seven day intervals, as was recommended in the original technic outlined by Engman. It has been difficult to arrive at conclusions in those cases where vaccine therapy alone was used. In some pustular types of acne the results have been excellent, while in many others they were disappointing. When the injections were used as an adjuvant to the combined roentgen and actinic treatment previously described, the results were highly satisfactory and we believe that the percentage of recurrence was decidedly lowered. In addition to this we have had a limited experience with a staphylococcus toxoid which has proved of no value. We have, however, been impressed with the efficiency of a non-specific foreign protein, manganese butyrate, in cases of pustular acne in which the staphylococcus appears to play the predominating rôle. This method of treatment has been used more extensively in England than in this country, chiefly in staphylococcus infections. The injections are given intramuscularly in two doses of 1 cc. and 1½ cc. at five day intervals and repeated if necessary after an interval of several weeks. There is usually a greater local reaction and more pain than with vaccines but the pustular lesions will often involute rapidly probably by stimulation of local leukocytosis.

### Dietary Regulations

The importance of regulating the patient's diet, particularly the carbohydrate and fat intake, during physio-therapeutic treatment for acne is obvious. Very frequently exacerbations can be traced to dietetic indiscretions. The relationship of food ingestion and food sensitivity has of late become a topic of importance in discussing the pathogenesis of acne. Strickler was one of the first to investigate the relationship between food anaphylaxis and acne vulgaris and came to the conclusion that the metabolic disturbance in acne is not along the line of food sensitiveness. The late Joseph Zeisler[15] in a discussion of the etiology and treatment of acne expressed the following opinion:

> We know that many dietary articles are directly productive of acne lesions, the absorption of toxic products from the intestine probably acting as vascular irritants. Herein we see a clear analogy to lesions resulting from the ingestion of iodides and bromides. But here again we are confronted by the fact that a good many individuals can tolerate any and all kinds of food without the slightest effect upon their skin and that only those who have a predisposition toward acne exhibit marked sensitiveness.

Cleveland White,[16] on the basis of a small group of cases, has suggested that certain specific foods, especially milk, chocolate, wheat, oranges, tomatoes and nuts were the cause of acneform eruptions of erythematopapular and papulopustular type. The causative foods in this series were determined not by cutaneous tests but by elimination diets or "nonallergic" trial diets. Many who heard White's presentation were unable to convince themselves that this group of cases could be classified as true cases of acne vulgaris. They were not associated with comedones or exces-

sive oiliness and appeared to be mainly of a mild recurring type. There certainly seems to be no justification from these observations for assuming that acne vulgaris is an allergic disease especially in view of the observations of Alvarez and Hinshaw that not all food sensitiveness is allergic in nature and that the digestibility of the offending food is an important factor. Many acne patients can ingest small quantities of sweets or chocolate without injurious effects, yet large quantities will often provoke a fresh outbreak of lesions. Some of the most intractable cases of deep seated pustular acne have in our experience been caused at least in part by the ingestion of large quantities of milk in the erroneous belief of the patient or the physician that this was necessary for proper nutrition. Another important factor first noted by Shelmire and since then stressed by Bechet and Sulzberger and Wise[17] is the prevalent use of iodized salt. At least 60 to 70 per cent of the acne patients who have consulted us in the last few years use iodized salt and a change to ordinary salt has often brought about a striking improvement within a few weeks. Sulzberger and Wise have also suggested the possible role of bromides derived from a bromate preparation used in the making of fresh bread. Every patient with acne should be given a diet list with instructions as to what foods to avoid. In addition he will often be able to note from his own experience what specific foods are responsible for exacerbations of his acne.

## Summary

The routine management of cases of acne vulgaris by physical therapeutic measures without other treatment often produces disappointing results. Each patient should be studied thoroughly to evaluate the several causative factors that may be present. Treatment should then be directed to correcting dietary errors, systemic conditions and other general factors in addition to appropriate local therapy.

In the author's experience the use of a short series of roentgen treatments followed by ultraviolet radiation and vaccine therapy has given satisfactory results in a high percentage of cases.

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## Discussion

**Dr. Lester Hollander** (Pittsburgh, Pa.): I have personally derived material information from this excellent review on the treatment of acne vulgaris. Although the title of this paper was limited to treatment, we listened to a complete review of the subject. Dr. Zeisler particularly emphasized causative factors and thus followed the footsteps of his father, the late Joseph Zeisler, to whom I wish to pay tribute, who pointed out two decades ago the relation of this disease to gonadal function. It was only recently (four years ago) that the late Bruno

(*Concluded on page 661*)

# THE FUNDAMENTALS AND INDICATIONS OF SHORT WAVE THERAPY, FULGURATION AND COAGULATION[1]

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More than eight years ago, when Professor Dr. Herold of the Technologic Museum in Vienna, his assistant technician Leitner and I completed the first construction of a therapeutic short wave transmitter, it was a dramatic moment to us, as we experienced on our own bodies the effects of a practically unknown electric force. In accordance with the theoretic presuppositions this experiment, as well as tests made later on animals, revealed the perfect harmlessness of the current. Nor have any late untoward effects been noted. On the basis of an actinologic conception, which had not been given before, I pointed out as early as in the year 1924, the circumstance that the section in Maxwell's spectrum, which had not been worked out, must contain a promising field of energy for therapy. At the same time I invited attention to the importance of the principle of resonance for biology. Soon after the first patients, namely, thirty-two sufferers from peripheral neuritis, were submitted to the new therapy with the best success. The technic was that of short wave fulguration, a quasi-monopolar method, which a little later was elaborated by us as typically monopolar antenna radiation, which we will discuss. Alongside of it we also made use of the field treatment by utilizing a copper spiral. The wavelengths with which we have worked since, were 2, 3.28, 4.25, 4.50, 5.20, 6, 7, 8, 9, 15 and 30 meters, while the energies fluctuated between 10 and 1500 watts.

Independently of us the American, Schereschewsky, has confirmed in this important publications our concepts of that time. He made radiation experiments with high frequency oscillations of short wavelength on mice affected with tumors and has given a biologic fundament for the new method of application of the electric current, which was given by us the name of short wave therapy. Ours as well as Schereschewsky's publications were taken cognizance of by the medical public, without the method being accorded its proper place as a superior therapy.

During the last few years short wave therapy has increasingly gained ground, and the interest of physicians and physicists has grown as did the concerned literature — the latter not always for the good of the cause. Errors in the literature have been due to failure to observe our original data, which resulted in a faulty technic, indications and evaluation of the method. As an example the superior effectiveness of short wave therapy in peripheral neuritis was simply negated, without, as was later established, an attempt having been made to make use of the proper technic. Again it has been asserted that there is a direct relation of individual pathogenic bacteria to definite wavelengths and thus a dogma of "wave specificity" was attempted which with ordinary knowledge of physics should have been denied in advance. The constant appearance of the question whether the effectiveness of short wave energy is produced thermically or electrically has caused much confusion. According to our experience dating back almost a decade, one thing is certain: It is not the linear increase of the current quantity which produces the desired therapeutic result, but the employment of small doses of exact emissions, occasionally determinable even in decimals which under certain circumstances must be introduced with very great energy. There is no intention at all of attaining a manifest heating in the old sense. This, as I have often stressed in my publications, is attainable by diminishing to the utmost possible the period of radiation and by increasing the individual applications. Accordingly the time of application should exceed

four to five minutes only in exceptional cases. The sensation of warmth experienced at the end of a séance represents the upper limit of the dose, which is named the *lower heat point.*

Opposed to this point of view is the opinion, especially widespread in America, that for the attainment of an adequate therapeutic effect, a largest possible sensation of warmth is essential, so that in short wave therapy the so-called electropyretic components are the real agency, a view which in my opinion means a return to diathermy. The goal set by us at the introduction of short wave therapy was by no means a further mechanic development of the diathermic method, but the employment of a heretofore unexploited radiation of a precisely definable character, continual quality and effect of a new kind. Apart from the fact that for the interior heating of the organism it would suffice to make use of an increased spark-gap arrangement instead of the expensive and quickly wornout electronic tube, such as are found in the so-called short wave diathermy apparatus which I have rejected, such a hyperthermization, whether attained with or without an electronic tube, is decidedly contraindicated in the majority of cases.

### Indications of Short Wave Therapy

We should mention in the first place endarteritis obliterans, also called angioneurotic dysbasia or intermittent claudication, respectively gangrene of the foot. Other indications are mal perforans of the foot and symmetric gangrene (Raynaud). The etiology of gangrene (tobacco, arteriosclerosis, diabetes) is of no importance for the success of radiation. The tissue which has already suffered local death in the form of dry and oftener of moist necrosis, which presents a frightful appearance, quickly and rapidly regenerates. The final demarcation takes place at the conclusion of radiation so far distally, that at first glance one would not believe the previous putrid, macerated decomposition. We have often been compelled to place the electrode into foul, stinking, decomposed tissue; we saw deep craters in the metatarsus which had room for the terminal part of the thumb. The skin presents a bluish discolored picture of irreparable nutritional damage, or there exists a dry mummification with a coal black, wrinkled surface without a sign of life. All these symptoms which in the past have been regarded as pressing indications for immediate amputation of the extremity, retrogress under a properly carried out series of short wave radiations without danger to life and with preservation of the limb. It scarcely needs mention that internal treatment of the fundamental disease must be given with the radiation therapy. As a supporting but by no means essential measure, a course of injections (menformon, padutin) and diathermy may be considered, but manual interventions, such as removal of necrotic parts, are strictly to be avoided. Filling of the arteries for diagnostic and even therapeutic reasons (abrodil) recommended by some authors, as well as the operation proposed by Leriche have appeared to me to be superfluous, to say the least.

The second important and today generally recognized indication is carbuncle of the upper lip. In the cases referred to me, almost all had grave general and local symptoms, great tension of the hard, swelled upper lip, edema of one or both sides of the face and excessive pain. Healing requires most often 8 to 10 séances, which are applied once or twice daily. At the beginning of treatment occasionally the sense of tension is slightly increased, at the same time, however, the central softening becomes more pronounced, the general condition is improved and the pain is rendered more tolerable. A noteworthy sign that regression has begun, and which the patient himself notices, is the appearance of a livid discoloration of the carbuncle and its surrounding tissue, such as one observes after the application of Bier's congestion. We cannot strongly enough voice a warning against any attempt to shorten the course of the infection by incisions for the purpose of allowing the escape of pus as such intervention has often led to a fatal termination. Similar directions apply to radiation of the neck and back for carbuncles, which often have an enormous size but are more benign, and of abscesses of the sweat glands, the ambulant surgical treatment of which is as long-drawn out as it is ungrateful.

Attention is also directed to a category of diseases of the skin and of the subcu-

taneous cellular tissue that are protracted and show no tendency to heal. We refer to serpiginous ulcers, especially of the leg, which have nothing in common with a varicose ulcer, but show a decided tendency toward tissue softening and extension both in depth and on the surface. As in endarteritis obliterans so here, too, there exists a pronounced necrosis, which is especially characterized by smeary, ragged deposits, seropurulent secretions, and by pains which often disturb sleep. According to appearances, which remind one of the character of noma, these conditions are based on a damage of the arterial supply in the domain of the capillaries. The local necrosis just described can be cured by short wave therapy, though not in a few sessions. For the patients who have already been discouraged by fruitless methods of treatment, including x-rays, the result is all the more pleasing.

Often the patient experiences a relief even after the first séance, something that was not achievable after years of treatment with ointments and the like. During the course the ulcer becomes clean, it is better flooded by blood, and entire necrotic skin rags and pieces of tissue fall off in the form of scabs. It requires, however, a long time for new epithelization, which begins at the margin, increases daily by millimeters, and eventually terminates as a scarless covering.

Another very stubbtorn affection of the skin, which falls into our domain, is neuritic eczema. Often appearing in the form of herpes zoster, sometimes as a hyperkeratosis of the skin, with predilection for the tendo-Achilles and the general low extremities, it annoys the sufferer by the very disagreeable itching day and night. Such neurodermatoses I have always successfully treated with short wave fulguration. Seldom have I seen a recurrence after years of a free interval, which, however, always responded to a new series of radiation. Apart from this rather rare affection, definite indications exist for perineal and pararectal fistulae which almost always have a specific character, erythema induratum Bazin, caries of the ribs, osteomyelitis, and, finally, external otitis, for which the immediately attainable relief of pain is especially striking. Splendid results are obtained with short wave treatment in the rare cases of pneumococcal metastasis of the wrist, in the arthritides of the small finger joints and in some types of empyema. A group by itself is formed by dental diseases, in which noteworthy results are seen in the treatment of granuloma and of pyorrhea alveolaris. Bustin has attempted to demonstrate the supposed inhibition of the otherwise virulent bacteria by chiseling the jaw and removing the exposed secretion from the treated part. Cultures taken from material of radiated teeth remained sterile. The disappearance of the fetid odor after a few radiations also speaks for a lessening of the bacteria. Naturally dental care in accordance with all rules of the art must not be neglected.

Occasionally a partial success could be observed in otosclerosis with its well-known unfavorable prognosis. More frequently we succeeded in favorably influencing attacks of the menière type and grave migraine by unipolar field treatment.

Of the grave affections of internal organs or systems many intestinal diseases, such as ulcerative colitis, pneumonic foci, abscess of the lung, and chronic prostatitis are apparently favorably influenced by short wave therapy. The question of the possibility of a favorable effect on cavernous tuberculosis, pleuritides, gallbladder, pancreas and kidney diseases, which we have studied for years with often surprising prospects, is still an open one. So far as diseases of women are concerned, which I have preferably treated with carbon-arc light radiation according to the Landeker-Steinberg method, investigations are still under way. Short wave therapy is to be combined with the method of prolonged flushing of the vagina, analogous to Janet's treatment of gonorrhea in males, which I have been the first to employ in Professor Bucura's clinic, and which later found its way to America.

The gynecologic prolonged retro- or underpressure irrigation is carried out after radiation in the following manner. From an irrigator with a central inlet pipe, which is held air tight to the vagina by a rubber arrangement, the fluid (potassium permanganate, soda) flows into the vagina without pressure. The flow of the liquid and its reversal of direction takes place through suction created by a very small water pump at the bottom of the irrigator. There is

created a pulsating movement of the fluid of small pressure which can be regulated with exactness, from within out, which is forced to the deeper strata of the tissues. This principle of an intensive but deeply effective vis a tergo, as in the Janet irrigation of males, and established by me thoretically for gynecology as early as 1919, must be regarded as a biologically correct, prolonged irrigation of the genitalia, which is also capable of favorably affecting the pelvic organs.

The indications above outlined show the extent of the applicability of short wave therapy. Nevertheless, from this rather incomplete enumeration it is not to be concluded that we regard the method as a universal measure and that we are not aware of its limitations. Thus, we state that we saw no improvement from short wave treatment of many an affection of the central nervous system, such as multiple sclerosis, tabes dorsalis, and epilepsy. Absolutely no effect from radiation in its present form and energy was had in all neoplasms. Likewise no effect was obtained in arthritis of the large joints, especially arthritis deformans, and some affections of the genito-urinary system, such as paraurethral abscess. The same applies no less to gonococcal affections of the joints (tendovaginitis, periarthritis). As it was precisely in this type of disease that Zeynek, as is well known, obtained his first successes with diathermy, the circumstance just stated is an additional proof for an essential difference between the two types of frequencies.

**Shortwave Fulguration and Coagulation**

As was stated in the beginning, fulguration with short waves was one of the first methods of application of this radiation. This method consists of the use of a monopolar active electrode (metal brush) attached to an auxiliary circuit, which is led over the surface along the course of a nerve and there creates the formation of microsparks. The fact that we had no reason to change this technic best shows its affectiveness and the general therapeutic value of the method, which is especially applicable in neuralgia dolorosa, the grave forms of trigeminal neuralgia, radial and ulnar neuritis, and finally, as already stated, in the chronic forms of neurotic eczema.

Short wave coagulation is relatively an intensification of fulguration. The effect of fulguration is not interpreted by us to rest on a thermic basis. While with fulguration injury of the skin, may be prevented, coagulation implies electric destruction of tissue, which, however, is not quite the same as that designated as "cooking." The application which is also monopolar, is far less painful, can be dosed more precisely, and is more effective than every other procedure of this kind (diathermic coagulation, Pacquelin). It is of comparatively little importance that with short wave coagulation nevi and pigmentations of the skin, even of considerable extent, can be removed without anesthesia without trouble and without leaving any visible scar. More important is the possibility of complete healing of those cone-shaped papillomas of the sole of the foot and the interdigital folds, which often render the afflicted incapable of following their callings and have compelled extensive and often unsuccessful operations. Short wave coagulation of these deep, horny cones is, however, often a painful procedure, because the tense tissues render infiltration anesthesia inadequate.

A new method of removing tonsils in cases in which surgical enucleation is contraindicated has been introduced by Frühwald and myself as short wave coagulation in chronically diseased glands. Tonsillectomy by high frequency currents, such as are used with diathermy, has emanated from America, where noted authorities, lately especially Zerzan, Doane, Silvers, and others have become engaged with the technic, indication and prognosis of this type of tonsillar coagulation. For our method of short wave tonsillectomy I am quoting Frühwald:

As early as 1931, we attempted, in addition to the diathermic coagulation introduced in America, the removal of tonsils by short waves .nd have reported on it three years ago in the Wiener Klinische Wochenschrift, No. 24, 1932. At that time we worked with an apparatus of 150 watts and came to the conclusion that it was possible totally to remove tonsils by necrotization, and that in contrast to coagulation by diathermic currents it is attainable almost painlessly even without an anesthetic. Its disadvantage was the long duration of treatment, which with tonsils of medium size extended over several months and put a tedium beyond the endurance of the average. We therefore studied ways and means to reduce the length of time for treatment. Only

by utilizing an apparatus of 1500 watts did we succeed in attaining our goal. As we have used this apparatus only a short time and therefore do not possess adequate clinical material, I would today give no definite and final judgment of the method of short wave coagulation of tonsils inaugurated by us. I believe, however, that the method is the simplest and most purposeful procedure for the total removal of tonsils for cases in which surgical enucleation (advanced age, heart and kidney diseases, high blood pressure, arteriosclerosis, hemophilia and the like) is contraindicated. As compared with diathermic coagulation we may already stress the advantage that the duration of treatment with a strong apparatus is essentially reduced. Its application is therefore more effective, more precisely controllable in dosage, while the sensitivity during treatment and the reaction are the same as with coagulation by diathermy apparatus. Our final position and the discussion of the method in detail is reserved for a later time.

To these statements is added that in the employment of extremely powerful short wave apparatus, as for example ours a tube equipment of 1½ kilowatt intensity working on a wavelength of 4 and 8 metérs — one must have for coagulation of any kind, a specially well insulated handle of the electrode. The interruption of the current furthermore should not be made by exclusion of the tube, which is damaged by it, but by utilizing a special interrupter in the handle. The strong formation of sparks produced by the noiselessly functioning apparatus is a gratifying contrast to the noisy procedure associated with diathermy. The tissue coagulated with short waves becomes instantaneously necrotic and separates smoothly on section.

A few remarks on the problem of the transmission of power in the high frequency sphere are given in conclusion. Until now the carrying of the electric current of the type under discussion to the diseased part of the body was possible only when the patient was transportable at least in bed. In some cases of septic endocarditis, general sepsis and other forms of constitutional debility even this possibility is unavailable, since the mere being raised in bed may aggravate the patient's condition. In the past few years our wishes were realized in the construction of portable short wave apparatus which can be connected to any lighting main, in most instances even without the addition of existing safety devices. The energy of these transportable appliances fluctuates between a few and 100 watts. Their wavelength can be low. With a direct current it is essential to interpose a converter; and in the presence of high tension, a transformer. Wherever there is at all available an electric current, in an emergency short wave treatment can be undertaken. Throughout the yield of energy will be in narrow limits, so that as a general proposition one will have to reply on the central treatment rooms. We have furthermore succeeded since the introduction of the so-called ray-free oscillating system with Lecher's wires, in carrying energy from one intensive central apparatus without essential loss to several places in the same or neighboring room, something that was not possible before. This modification of electric transport has been realized in the installation of our new institute in Loew's sanatorium.

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(*Concluded from page 656*)

Bloch, the great Swiss dermatologist, corroborated this very relationship. Acne vulgaris is an important condition not only on account of its relative frequency, but because the youthful sufferers become self conscious and embarrassed. It interferes with their normal life, and I know of many who have developed an inferiority complex difficult to eradicate. As Dr. Zeisler stated acne vulgaris must be treated carefully and I subscribe to the method of treatment which individualizes and in which physical therapy plays an important part. A combination of x-ray and ultraviolet ray treatment acts beneficially in many instances. I use little less than ¼ unit of unfiltered x-ray (75r) as a weekly dose for three or four weeks, then lengthen the period to one treatment every two to four weeks for a similar number of treatments. At each visit the comedones are gently removed and a very mild general body irradiation with ultraviolet is given. After the completion of the course of treatments, which of course include correction of diet by the elimination principally of milk and chocolate and looking after the proper bowel function, etc., in case there is a marked scarring and pitting I use a "cold quartz" lamp to exfoliate the skin. I am convinced that this procedure is of value in most cases.

# THALASSOTHERAPY *

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The ocean's lure to human beings is as old as humanity itself. Despite the fact that the human race conquered the boundless water surfaces several thousand years ago, prolonged sojourn at the seashore and marine hydrotherapy, two great modifiers of the human constitution, were not used with purpose up to the middle of the eighteenth century.

The old Greek curators administered sea water as a laxative. There are a few vague statements in Hippocrates as to the effectiveness of its external application in the form of showers and affusions. Due to Richard Russel's far sightedness, for he was the first to advocate sea bathing as a treatment in the middle of the eighteenth century, and to the lucky fact that the reigning monarch submitted himself to the effects of the cure Brighton, England, sprang up as a fashionable resort. In 1791, the royal sea-bathing hospital was founded in Margate, England, under the supervision of Dr. Latham. After England's discovery of the benefits of ocean bathing for the world, colorful crusades started in Italy, France, and Germany, in favor of ocean therapy. Barellai of Italy, Perochaud of France, and Benecke of Germany, are the real fathers of *thalassotherapy: therapeutic utilization of maritime climate.*

It is due to their efforts that the ragged seacoast of Europe has numerous bioclimatic research institutions; it carries about 400 seashore sanatoriums and preventoriums, with about 30,000 beds. Most of the seashore sanatoriums or sea-hospitals are adequately equipped for special purposes. For instance, the hospitals for the treatment of extra-pulmonary tuberculosis are, for the most part, planned and built in pavilion system, each pavilion containing 20 to 100 beds. These institutions are built close to the shore, with separate pavilions for children, adults of both sexes, and a pavilion for isolation. The real pace-makers of scientific marine climatotherapy are Germany, France, England and Italy, but I think it is worth while to consider for a moment the rôle a small-sized European country plays in the maritime cult. I mention Belgium on the North Sea, the area of which is less than a fourth of New York State, the number of its population somewhat above that of New York City, the country having a seashore only 40 miles in length — half of Long Island's seashore. On this short stretch the country possesses not only the world renowned watering places such as LeZoute, Duinbergh, Blankenberghe, Ostende, Westende, Le-Coq, Nieuport-Les Bains, but over 40 seashore sanatoriums with 3,500 beds — a sanatorium on each mile of the seashore.

According to differing geographical location, we know three maritime climatic types, with distinct differences in climatic factors, biological effects and therapeutic indications:

1. *The southern sea climate.* — Mediterranean, Florida.

The southern sea climate is characterized by a remarkable equability of temperature, abundance of sunshine, mild sea-breezes, convenient degree of humidity, enabling an all-year-round out-of-door existence. The atmospheric temperature never drops to freezing point, the water-temperature never goes below 65 degrees F. It is due to a lack of irritating factors in the southern climate that we call it a sedative, protective climate.

2. *The northern sea climate.* — New England, Baltic Sea.

The northern sea climate is characterized by stiff sea breezes, low water temperature, marked difference in the temperature of air and water, even in the summer, more than ten frosty days a year, due to which factors, we call it a tonic, a stimulating climate.

3. *Transitional sea climate.* — New York, New Jersey, Virginia, France.

Summer heat eased by sea-breezes, fall resembling the northern sea summers, winter considerably milder, less than ten days of frost a year. A common characteristic of every seashore is the relative thermal equability. The heat economy of the big water masses is saving, that of the inland is wasteful. The main temperature of the seashore sum-

* Read at the Thirteenth Annual Session of the American Congress of Physical Therapy, Philadelphia, September 10, 1934.

mer is lower, that of the winter higher than the main temperature of continental areas in the same time and at the same level.

The many thousands of miles of sea shore give the United States a most fortunate and unique position, possessing all three sea shore types within its boundaries. The Pacific cittoral, to cite an example, embraces the entire range of climatotherapeutic possibilities.

### Maritime Climate Factors

In addition to the number of known and unknown minor cooperators, the three leading maritime climate factors, each a complexity in itself, are air, sun and water.

"The sea air should be looked upon as a remedy in itself," says Churchill's Medical Directory. How a change of air can profoundly modify breathing, circulation, metabolism, cannot at present be explained, but many delicate children and invalids are as sensitive to the quality of air as are plants.

A satisfactory explanation of this statement can be found in an analysis of the qualities of sea air:

1. High oxygen content: 20.99 against 20.86 per cent in the continental air.
2. Increased ozonization above the ocean.
3. Absolute purity: Freedom from dust, pollen, allergens, carbon monoxide and gaseous products of combustion.
4. High negative ionization.
5. High barometric pressure.
6. The sea breeze: This is an important feature of the summer along the sea shore. It is aroused and maintained by the increase in difference in the temperature between the inland and ocean surfaces. It luckily reduces the range of sea shore temperature by moderating the midday heat. It reaches shore in the middle of forenoon with the velocity of ten to fourteen miles per hour.
7. The sea breeze maintains a *sufficient degree of humidity*. The humidity carried on the wings of sea breeze seldom exceeds 75 per cent. The sea breeze is a powerful, natural, air conditioning mechanism of the sea shore, producing a desirable thermal equability, and maintaining a convenient degree of humidity.
8. The sea mist: The sea breeze whips away fine, minute water particles from the crests of waves breaking on the sandbars of the sea shore. It carries this mist, containing chlorides, bromides, iodides, in traces, about 50 to 100 yards inland.

*Insolation.* There is a distinct difference in the qualities of insolation on sea shores and elsewhere. This difference is caused by the cleanliness and humidity of sea air and by the radiation reflected by the water surface and beach sand. The humidity of the atmosphere doesn't weaken the biologically important wavelengths around 300 millimicron, nor are they lessened by dust, soot, or any oxidizable organic matter in the pure air masses above the ocean. Quite the opposite happens to the rays arriving on longer wavelengths. Infrared rays are markedly swallowed by the humidity.

The wide open spaces on the shore or on ocean trips allow the full action of skylight radiation which, on partly cloudy days, exceeds the amount of direct radiation.

Campbell gives the same importance to the reflection from the ocean surface — the sea shine. The reflex radiation of sandy beaches also cannot be overlooked. Many a case of conjunctivitis is caused during the summer by the strong glare of sand, and everyone knows the even, deep tan of those returning from ocean trips.

*Water.* The sea water is a compound salt solution of 2-4 per cent of concentration containing mainly sodium chloride and potassium, magnesium, calcium, bromide, iron, phosphate, iodine, arsenic, and strontium in traces. As it is proved that no absorption of these mineral contents occurs, even by prolonged bathing through the skin, the effects of sea-bathing must be attributed to the following factors:

1. The temperature of the water.
2. The difference between the temperature of the water and of the air.
3. The difference between the temperature of the skin and of the water.
4. Mechanical stimulation by the waves of the surf.
5. Counterirritation of the skin by the salt content of the water.
6. Degree of exposure after bathing.

There are several minor factors cooperating in the effectiveness of a marine cure, for instance, the iodine content of the air, drinking water, milk, eggs and sea food. The minor climatic factors, as the somewhat increased oxygen content of the air, the ozonization and the increased negative ionization seem to be negligible, but we must consider that during a sojourn of eight to twelve weeks at the seashore the system constantly is exposed to the simultaneous effects of these factors.

### Biological Evaluation of the Climate Effect

Everyone on approaching the sea shore, notices a sudden ease of breathing, as if some-

thing pressing was escaping from the chest. This automatically improved breathing mechanism is due to the purity of the air. This renders a reflectory contraction of the bronchioles — a vagus controlled defense against dust, soot and acrid impurities of city air unnecessary. The relatively high degree of humidity in the sea air eases up the activity of the ciliar epithelium in remóving mucus and impurities. The flat, rapid breathing of the city child gets deeper, slower, more thorough and, as a result of this, the vital capacity of the lungs increases up to 500 cc., the chest expansion up to 2 to 3 inches, all after a 6 to 8 weeks' sojourn in the summer or fall in a northern or transitional climate. The next organ influenced by the climate change is the skin.

The life in the cities, with its lack of free air exposure, lack of insolation, the heating, and the clothing of modern life, harm the physical heat regulation. The skin becomes "domesticated." It loses its faculty for dodging sudden, intensive changes in temperature by tonic contraction of the skin blood vessels — the physical heat regulation. This mechanism has to render the healthy reacting skin similar to a poorly heat-conductive leather coat. Confronting sudden changes of temperature, the domesticated skin gives up its tone, the inner temperature drops, the child shivers and catches cold. Fifty per cent of the children newly arrived at the seashore react in this manner; after only six weeks at the seashore, only 25 per cent. This shows that the loss of heat regulation can be regained. The skin becomes acclimated, hardened. The skin temperature of these hardened children drops, while their rectal temperature increases after a sea bath. They feel comfortable and warm. They do not shiver. The metabolism increases sharply up to double values and above.

The pace-maker of this increased metabolism is the endocrine gland system. The thyroid, parathyroid, adrenals and gonads, governing the sympathicus nerve system, direct the process of acclimatization.

The sojourn at the northern seashores in the summer or in the fall at the transitional shores, even without bathing, is a constant exposure. This constant exposure, this regimen refrigerans acts in a sympathico-tonic way. There are several proofs for this statement: 1. The relatively sporadic occurrence of goiter at the seashores; 2, latent toxic goiters becoming manifest as a result of excessive exposure to seashore climate; 3, dysmenorrheic symptoms are lost at the seashore, and 4, prolonged sea baths increase the hexosuria in diabetics. The existence of sympathetic-parasympathetic imbalance, the character of it, and the switch toward sympathicotony after a few weeks of the thalassotherapy can be determined easily in most cases by biologic reactions and by pharmaco-dynamic methods. (Häberlin and Dresel) as by the bulbus or oculo-cardiac and solar-plexus reflex and by the adrenalin test.

The gastric secretion increases under the influences of climate, enhancing the assimilation of calcium and phosphorus. After a negative phase of individual duration, the alkaline reserve increases as a sign of completed acclimatization. Albumen retention is considerably increased. Blood cell count shows an increase of erythrocytes; leucocytes are inclined to decrease in number, monocytes to increase. There is always an interesting fluctuation of these values during the cure similar to that found in a fever attack, or during a cure of non-specific protein therapy.

Clinically, the following changes are noticeable in children at the seashore. Their growth, both in height and weight, exceeds the normal; their muscular power increases; their skin becomes firmer, increased in turgor; their nails become thicker; hair more abundant; lost appetite returns; dislikes for certain dishes disappear, chronic constipation, enterospasms, Chwostek phenomenon become less frequent, restlessness, night terror, generally disappear.

Not at all negligible are the effects on the psyche of the changed *milieu* at the seashore. The ever changing beauty of the scenery, the play of waves, the eternal motion of the sea, divert the introspective attention of the neurotic. The wide horizon, the greatness of Nature diminishes the pathologic importance of the ego. The ease of breathing, the feeling of relaxation, the returning appetite and the healthy fatigue in the evening, all cooperate toward that euphoria so important in starting an advantageous change in the condition of the chronic sick or convalescent.

The modern opinion about the mechanism of climate effect is that the human system and the climate surrounding it compose a bio-

logic unit; that the human system, as every living organism, is dependent upon its climatic environment. The exposure to a changed and stimulating environment starts a slight disturbance, produces a micro-damage in the system to which it answers by mobilization of its forces of defense. Through this increase of reactive defense, not only the artificially set micro-damage but pre-existing disorders of faulty balance will be overcome by what we know as and call the process of acclimatization.

### Rationale of Thalassotherapy

The sea climate is a very complex pharmacon, possessing protective, mildly tonic, stimulative and excitant factors according to the season and geographical location and the selective utilization of climate factors on a given shore.

The three main forms of Thalassotherapy are:

A. Sojourn in the seashore climate.
   1. Sojourn at the seashore.
   2. Prolonged ocean trips.
B. Selective utilization of stimulating climate factors.
   1. Free air baths.
   2. Sun baths.
   3. Sea baths.
C. Specialized forms of treatment, having the ocean climate as a background.
   1. Marine hydrotherapy:
      a. Surf bathing.
      b. Brine baths, concentrated sea-water baths for the treatment of scrophulosis and chronic inflammation of the female pelvis.
      c. Mud baths and mud packs for the local treatment of chronic arthritis.
      d. Baths in heated sea water.
   2. Hot sand baths for neuritis, fibrositis.
   3. Inhalation of atomized sea water for catarrh of the upper respiratory tract.

The following suggestions for the proper selection of climate are offered:

1. Southern places should be preferred in winter and spring.
2. Northern places in summer and fall.
3. Transitional places should be preferred in summer, fall and early winter.

The main biologic indications for *southern* places is the migration of the aged and chronic sick to escape the hardships of winter. The thermal monotony of the climate of southern shores in the winter is an ideal background for the treatment of subacute stages of rheumatoid arthritis by physical therapy.

Biologically suitable for a sojourn in summer and fall at *northern* shores are the child and young adult with lost heat regulation and recurring colds. The hard northern climate builds a strong race by favorable modification of acquired constitutional weaknesses.

The transitional sea climate combines the advantages of both climate types, with a summer season similar to the southern spring, and a beautiful fall season resembling the northern summer. French authors report successful winter cures for children with recurring colds and surgical tuberculosis at northern and transitional seashores.

The main requisite of successful thalassotherapy is to find the optimal amount of climatic stimulation. This optimal amount varies according to the condition, constitution, and age of the patient and the stage of the chronic disorder to be influenced. The timid individual arriving with and continuing to wear two undershirts at the seashore is as much in error as he who exposes himself recklessly. While the former will not enjoy the benefits of a favorable systemic modification, the other will undoubtedly feel the unpleasant symptoms of the so-called supersaturation, which are:

1. Nervousness.
2. Headaches.
3. Loss of sleep and appetite.
4. A sense of fatigue and ill-health.

### Indications and Contraindications of Thalassotherapy

Conditions beneficially influenced at the seashore are:

*Children* —

A. Respiratory disorders.
   1. Recurring inflammation of the upper respiratory tract.
   2. Convalescence from influenza, pneumonia, whooping cough.
B. Extra-pulmonary tuberculosis.
   1. Cervical, bronchial, and mesenterial glands, scrophulosis.
   2. Bones, joints, peritoneum.
C. Constitutional imbalance.
   1. General debility, retarded development.
   2. Exudative diathesis.
   3. Hypothyroidism.
   4. Rickets.
D. Functional digestive and nervous disorders.

*Adults* —
Convalescence.
Nervous exhaustion.
Chronic inflammation of the upper respiratory tract.
Asthma, hay fever.
Extra-pulmonary tuberculosis.
Chronic arthritis.
*Aged* —
Arteriosclerosis, hypertension.
Chronic arthritis.
Chronic bronchitis of the aged.

Sojourn at the southern seashores in any season has practically no contraindications. The same can be stated for the summer and fall at transitional seashores. The excessive stimulation present in the climate of northern shores, the strongly irritative factors in the stormy late winter of transitional places and surf bathing are contraindicated in:

1. Pulmonary tuberculosis.
2. Hyperthyroidism.
3. Severe neurosis and vasomotor disorders.
4. Myocardial weakness.
5. Acute and subacute arthritis.
6. Cachectic conditions.

Failures for thalassotherapy are ascribable to:

1. Faulty selection of the place or of the season.
2. Disregard of contraindications.
3. Insufficient exposure to climatic influences.
4. Overstimulation, supersaturation.
5. Poor habits of living continued at the seashore.

Most of these failures can be prevented. Thalassotherapy could be utilized to its optimal advantage by cooperation between the physicians of the city and the seashore. The family physician should provide his patient with a report describing the constitutional shortcomings, stating diagnosis, laboratory findings, and the therapy previously given. This would assist the physician at the selected health resort in observing and supervising the important period of acclimatization, according to individual requirements. The cure finished, the seashore physician will report, of course, his procedures and observations in order to suggest appropriate aftercare.

I propose that the Congress of Physical Therapy shall try to influence some of our universities to organize bioclimatic research institutions with advisory service and physical therapy clinics on our seashores. These clinics, which would be self-supporting, will be the pioneers of scientific thalassotherapy in America and should offer post-graduate courses in the proper utilization of the therapeutic possibilities of seashore climate.

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## Einstein Proved Right Again by Light From Hottest Stars

Einstein is again proved right, this time by light from the universe's hottest, most luminous and most massive stars, observed by Dr. Robert J. Trumpler of the University of California's Lick Observatory, on Mt. Hamilton, Calif., who told the National Academy of Sciences about it at its opening meeting.

One of the three famous tests of Einstein's general theory of relativity was proof of what astronomers call "red-shift," which means that a large mass like the sun or another star pulls back on the light energy it radiates and increases its wavelength. The famous heavy-weight dwarf star companion of brilliant Sirius, whose matter is 4,000 times as dense as on earth, showed this predicted effect in observations at Mt. Wilson and Lick Observatories about a decade ago, but later observations indicated that this heavy-weight bantam star may be brighter in light than suspected and also that it may be twins. Some felt this spoiled its support of Einstein.

Dr. Trumpler searched for and found the Einstein shift effect in light from what are called the class O stars in the great star clusters of our Milky Way.

The astronomer's study is complicated by the fact that stars often rush away from or toward the earth at such tremendous speeds that this also changes wavelengths, a phenomenon called the Doppler shift. Dr. Trumpler got around this difficulty by comparing small and large stars of the same cluster so that their motions could be ignored.

The class O stars showed such greater red-shifts of their light that Dr. Trumpler is confident that they uphold relativity. Using the theoretical value of the relation of red-shift to mass, he then used the red-shift to determine that the hot and luminous class O stars are on the average 180 times as massive as the sun. — *Science News Letter.*

# PHYSICAL THERAPY IN ANGINA PECTORIS AND CORONARY OCCLUSION *

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The syndromes angina pectoris and coronary thrombosis have been very much in the medical limelight. They are dissimilar in that one is a symptom and the other a pathologic lesion. They are similar in that advanced age is an essential factor before certain anatomic and pathologic changes can take place in the coronary arteries. These changes are essentially necessary before either coronary occlusion or angina pectoris can develop. The close relationship of the symptoms makes a comparison of these entities a necessary feature of this discussion.

Levine asserts that the clinical recognition of coronary thrombosis has been developed during the last twenty years, predominantly by American physicians. This knowledge has come through careful observation of clinicians coupled with post mortem studies, rather than by any of the more complicated processes of experimental investigation.

Before its recognition as a clinical entity, coronary occlusion was considered a pathologic curiosity. Sequelae such as rupture of the heart, aneurysm of the ventricles and myomalacia were generally not associated with their etiology. The symptoms now properly interpreted were then classified with angina pectoris. This error was committed by Osler in 1910, and by Sir James MacKenzie as late as 1924.

Dock in 1896 was the first author to describe a case diagnosed ante mortem and proved as such at autopsy.

In 1910, two Russians, Obratzow and Straschesko, emphasized the importance of retrosternal pain and gastralgia as diagnostic symptoms of coronary occlusion. They also noted that different clinical and pathologic events might result, depending upon the size and location of the artery involved.

Herrick, of Chicago, some twenty-two years ago removed coronary occlusion from the realm of pathologic curiosities by emphasizing the fact that it is possible to make a clinical diagnosis and that death does not necessarily always follow. Five or six years elapsed before widespread attention was given to this syndrome. Yet it was Herrick who gave this impetus to American medicine.

Lebman and Levine followed with contributions on this subject, and F. M. Smith, of Iowa, performed his classic work of ligating the coronaries of dogs and defining the resultant electrocoardographic changes which have become an important diagnostic aid.

In Great Britain ante mortem diagnosis of coronary thrombosis was not given widespread attention until after 1825. Sir Clifford Allbutt's championship of the aortic theory of precordial pain was the influence largely responsible for this retardation.

France and Germany were also slow, and unless the disease incidence in Europe is much lower than here, the diagnosis is still made with relative infrequency.

The syndrome angina pectoris, on the other hand, was named by William Heberden in 1768, at a lecture given before the Royal College of Physicians in London. His original description is still quoted as a classic.

## Angina Pectoris

Angina pectoris is a symptom of abnormal physiology. Levine states that "the pain may be interpreted as resulting when the blood supply to the heart, or part of the heart, is limited and consequently inadequate when the heart is called upon to do work at a certain increased rate: a condition of relative ischemia."

The mechanism is unknown but appears to be primarily dependent on absolute or relative insufficiency of the coronary circu-

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lation, giving rise to myocardial anoxemia. Just how this acts on the nerve endings and centers is not known, but aching can be produced in any muscle by shutting off or limiting its circulation, especially when the muscle is contracting. The more the coronary circulation is limited, the less exertion is needed to produce a paroxysm.

Burn long since supported the ischemic theory, but here again the aggressive championship of the aortic theory by Allbutt caused it to fall into disfavor. The work of the last few years on coronary thrombosis has again brought ischemia associated with anoxemia into considerable prominence as the theory of the cause of the symptomatology. The pathology that will permit the development of an anginal paroxysm in coronary disease manifests itself in the following changes:

First, coronary sclerosis with or without complete obstruction of the lumen of the vessels.

Second, occlusion or encroachment of the mouth of the coronary arteries by syphilitic aortitis. The relative frequency and severity of angina pectoris seen in aortic insufficiency of luetic origin deserves comment, the reason being at once apparent because syphilitic aortitis produces angina by two mechanisms.

Anatomically the coronary mouth is blocked and the efficiency of the aortic valve is destroyed. Consequently the physiology of the circulation is altered, but an anginal paroxysm is not induced unless one or the other of these conditions is present. This fact is an argument against the aortic theory advanced by Allbutt.

Cases that do not fall under this group either are not completely examined or else the diagnosis of angina pectoris was at fault. Conversely these elements may be present without pain, their counterpart being coronary thrombosis, which also may be painless.

Coronary thrombosis occurs in disease of the coronary arteries usually as a part of a general arteriosclerosis. Degenerative plaques form within the lumen of the coronaries. These ulcerate or project into the lumen, narrowing the blood channel. The arteries harden, become tortuous, brittle, and no artery is exempt, but the descending branch of the left is more often affected than any other, as it is more exposed and is subject to greater stress and strain.

Collateral circulation is poor, as the coronary arteries anastomose with relative infrequency. If a branch is obstructed we have a pronounced ischemic area. Immediately there follows irregular muscular contractions and a group of symptoms varying in intensity in direct ratio to the extent of the lesion. If dissolution is not immediate, collateral circulation is sufficient to restore muscular action. Subsequent improvement depends on the degree to which the circulation can be reëstablished.

First, the normal anastomosis.

Second, the possibility of a reversal of the flow in the Thebesian veins (small channels which drain the myocardium directly into the cavities of the ventricle and are supposed to take care of about one-fourth of the return flow). This theory is controversial.

Third, there are extracardiac vessels that frequently anastomose with the coronaries by way of pericardial adhesions. This anatomic arrangement is an established fact. This is one way healing of the lesion takes place wholly or in part.

The muscle area, deprived of blood, immediately becomes livid and undergoes fatty necrosis, softens and may rupture. The collateral circulation is sufficient to insure that the area of destruction is smaller than the area supplied by the obstructed artery. If the area is small enough complete recovery may take place. At least eight weeks are required for this process.

In the diagnosis of angina pectoris, advanced age is a marked factor and this rarely except in luetic infections.

Since angina pectoris is a symptom of a morbid physiology, our prognosis depends on the extent of the coronary lesion. This lesion being pathologically a progressive, destructive process, the prognosis is necessarily bad, and subsequent life is limited to five to seven years.

Coronary occlusion, on the other hand, is a definite pathologic lesion and is usually characterized by severe retrosternal or epigastric pain, variable heart action, falling blood pressure, leucocytosis and a rise in temperature. Exceptionally cases have no pain and a diagnosis of acute indigestion is all too frequently made.

The prognosis of coronary thrombosis depends on the extent of the lesion and the degree to which collateral circulation may be established, and while there is no future for angina pectoris, coronary thrombosis may be completely cured.

### Treatment

The present treatment for coronary occlusion is absolute rest in bed at least eight weeks, morphine in adequate doses, supportive treatment, and no digitalis during the acute stage of the disease.

Surgery for angina pectoris is only available in the hands of the expert. Pain is eliminated but also nature's danger sign. Exercise must be regulated to meet the progressive cardiac ischemia. This means less and less exercise.

Emergency medication when called for is amyl nitrite, nitroglycerine and alcohol in ounce doses. More protracted in action is sodium nitrite (1 gr.) by mouth. Two prophylactic drugs are erytho tetranitrate and mansald hexanitrate. Amophyllin, metrophyllin and digitalis are not contraindicated.

White claims that in angina pectoris deep roentgen ray irradiations bilaterally over the back at the sixth upper thoracic rami have seemed to help. This work is still in the experimental stage. Diathermy in recent years has been recommended in the treatment of angina pectoris, but the results have been disappointing, as could be expected on theoretic grounds.

As physical therapists, I feel that we should take issue with White in regard to the use of diathermy, though much of the work has been so indifferently and inadequately done as to justify his statement.

Perhaps no other condition has been so wholly dependent on clinical observation for our knowledge as coronary thrombosis and angina pectoris. To illustrate the efficacy of deep heat, I submit the results in several different types of circulatory obstructions.

In phlegmasia alba dolens we have an obstruction due to an infective thrombus in the femoral vein. Nature is unable to exert sufficient arterial pressure to completely establish collateral circulation. On the theory that conversive heat will relax spasm, dilate arterioles and perhaps stimulate absorption of debris, I have applied diathermy with complete recovery, even in cases of bilateral phlegmasia.

In endarteritis obliterans we have an obstruction of the lumen of the arteries due to arteriosclerosis. Patients must agree to be treated twice or three times a week for at least three months. Cases so treated will show a marked improvement.

Another related ischemic condition treated is that of a medical student who had had anterior poliomyelitis. Steindler, of Iowa, did an astragalectomy and had operated twice. The subsequent school year came, the foot gave out and the student was forced to come home. Steindler referred this case to us for infrared treatments. Basing on the ischemic theory, we immediately applied diathermy. During the entire first treatment one side of the foot and ankle remained white. During each subsequent treatment the color improved and as the ischemia disappeared, the condition cleared up and the patient was able to return to school. The majority of all post-operative ischemias respond in like manner.

If circulatory deficiency of other parts of the body responds to the use of diathermy, the question suggests itself why it should not elicit a similar effect in the cardiac area. Since 1922, we have administered to the precordial region conversive heat generated by diathermy. We have given thousands of treatments with no bad results. If, however, the heart has been decompensated or is decompensated with low blood pressure, we have found it conducive to the best interests of the patient to treat cautiously until tolerance is established.

As an adjuvant to medical therapy, diathermy will be found as efficient as heat in ischemias elsewhere in the body.

To illustrate this point, I submit the following case: A man in the early fifties had been treated by a local physician. Subsequently he went to the University of Iowa where a diagnosis of angina pectoris was made. The prognosis was unfavorable and he was told that he should retire from the farm. The paroxysms of pain were extremely severe and frequent, he could not walk even as far as the barn without an attack. This patient had pronounced constipation and a systolic pressure below 100 Hg.

We instituted treatments of ultraviolet

irradiations twice a week to build up his reserve through the stimulation of the internal secretions, and conversive heat twice each week, treating alternately the liver and heart. It was necessary to go very slowly in treating the heart. Some forty treatments were given between October and February. As a result, during March, assisted by his hired man, he was able to prepare his summer's fuel. His subsequent condition remained good.

It was with a great deal of trepidation that I approached the treatment of an acute case of coronary thrombosis. The first case of coronary occlusion was in a man in his early sixties; the attack was severe. Conversive heat was used, because morphine gave no relief. To our surprise relief was obtained so that daily treatments were continued. The patient made an uneventful recovery.

Another case was that of a man of sixty-five. I found him at one of our hotels early one morning suffering the most agonizing retrosternal pain. He was removed to the hospital and here again morphine failed while conversive heat gave relief. Treatments were continued and the patient recovered. A year later this man was in town and reported good health.

Had these cases been complicated by essential hypertension, we would have had a different story to tell. We all realize that palliation is all that can be expected from whatever form of therapy one may institute in such complications. The internist may refute our arguments in favor of conversive heat, but we cannot gainsay the relief given to pain by diathermy. This in itself is a worth-while contribution to the therapy of coronary occlusion.

### Summary

We find coronary thrombosis and angina pectoris with the same underlying pathology and so closely allied in symptomatology that in many instances it is difficult to draw a clear line of demarcation. The inevitable result in many instances is faulty diagnosis, an unfortunate fact because of the difference in prognosis and treatment.

The number of cases of coronary thrombosis that are permitted to die with a diagnosis of acute indigestion is appalling.

With the wealth of clinical information available early correct diagnosis and appropriate treatment need no longer be withheld. Diathermy properly applied to the cardiac area has proved a valuable adjunct to other remedial measures.

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### Spectroscope Is Used to Study Types of Sunburn

The spectroscope, instrument that analyzes the light of stars, chemicals and other industrially useful things, promises to tell why some skins sunburn with rashes and splotches and others just redden and tan.

To the Massachusetts Institute of Technology conference on spectroscopy, Dr. Harold F. Blum of the University of California explained the use of the spectroscope to study various kinds of sensitivity of human skin to light.

Normal skin is sensitive only to that light which ordinarily produces sunburn and then tanning, he said, but some skins possess some special pigments which respond to light with various rashes and splotching. By sorting sunlight with a spectroscope, he was able to filter it and determine the exact wavelengths which caused particular rashes. This may suggest possible cures, although no progress in this direction has been made as yet. — *Science News Letter.*

# CONTROL OF PAIN AND HEMORRHAGE IN ELECTRO-SURGICAL TONSILLECTOMY *

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Markedly conflicting opinions still exist with reference to the problem of pain and hemorrhage occurring in electrosurgical extirpation of the tonsils. There are some, who while acquiring the complicated technic, prematurely condemn the method as inefficient and even more dangerous than surgical tonsillectomy. They have evidently forgotten the time and effort needed to overcome the hazards of classic tonsillectomy. There are others, however, who like Ground,[1] have no compunction in "introducing electrocoagulation as the method of choice for the sterilization and removal of tonsils in the adult."

To imply that perfect control of pain and bleeding is possible in every case of electrosurgical tonsillectomy, means either an allusion to good fortune of the operator or an acknowledgment of ignorance of the anatomy and physiology of the tonsil and its adjacent structures. It is now possible, with a modification of the coagulation technic, which I introduced in 1930,[2] so to control pain and bleeding that its incidence may be considered as negligible. Experience with approximately two thousand electrosurgical tonsillectomies covering a period of twelve years and including a large group of physicians amongst whom were some nose and throat specialists, causes me to feel more strongly than ever in favor of a modified tonsillar electrocoagulation as the method of choice in the adult.

As explained in an analysis of one hundred routine cases,[3] pain is a factor in the extirpation of the tonsil independent of any reaction that may occur following each treatment. The "immunity reaction" that ensues is apparently dependent upon the type and virulence of the organism infecting the tonsils. Pain on the other hand depends on the damage done to normal epithelialized structures. To avoid pain we must first re-evaluate the importance of the anatomical structures surrounding the tonsil from the electrosurgical point of view. A scientific appraisal of the morbid lymphatic structure which requires removal and of the innocuous epithelialized tissue to be avoided is essential to success in this field. The tonsil alone must be coagulated and the palatoglossus and palatopharyngeal muscles or pillars as well as the plica semilunaris above and the plica triangularis below should be strictly avoided. This is made possible by the use of special pillar retractors and an improved set of biterminal and monoterminal active electrodes.

Examination of the throat enables the experienced operator to determine at once if a given case is simple or difficult to manage. The size of the tonsil, redundancy of pillars, adherence of plical folds and the depth of the faucial cavity may all be surveyed at a glance. The large, infantile, highly lymphatic tonsil non-adherent to surrounding structures is the easiest to remove. The small, deeply imbedded, fibrous tonsil adherent to its plical folds and bound down by repeated exudative inflammation requires considerable skill to avoid undue pain. Topical application of 2 per cent pantocain for a period of 10 minutes is necessary to avoid the pain which accompanies the contact of the active biterminal electrode with the plical folds covering the deeply imbedded tonsil. To allay pharyngeal reflex in a hypersensitive individual I resort to a lozenge containing amidopyrine (2 grains) and butyn (½ grain) prepared in a pleasant tasting excipient. This troche is dissolved on the tongue just prior to the application of the local anesthetic and may be used at intervals following treatment to allay irritation. The apparatus should be set to deliver a smooth, non-fluctuating current sufficient to produce uniform, non-adherent coagulation. Only an apparatus of low voltage, though high frequency, can accomplish this desired result. The "sparkless" circuit put out recently by the High

* Read at the Fourteenth Annual Session of the American Congress of Physical Therapy, Kansas City, Missouri, September 10, 1935.

Tension manufacturers has proven most efficient in my hands. The older types of high tension machine built primarily for medical diathermy are unmanageable and cause many of the difficulties encountered in electrosurgery. I cannot emphasize too strongly the importance of a properly constructed coagulation, desiccation and fulguration circuit for attaining desirable end-results with a minimum of discomfort.

Pain is best avoided by careful retraction of the upper reflection of the capsule, the plica semilunaris, when coagulating the upper pole of the tonsil. It is of paramount importance to completely ablate all of the cryptal tissue in the superior fossa right down to the membrana basalis. It is in this upper fossa that access to the retrotonsillar area is gained through the very thin capsular tissue separating the tonsil proper from the aponeurosis of the constrictor muscle. Usually the capsule is anomalous here, and a direct communication permits infection to pass into the potential peritonsillar space. With a previous history of quinsy or retrotonsillar abscess it is necessary totally to eradicate all infected tissue posterior to the tonsil and to obtain a smooth, glistening fossa formed by the aponeurosis of the constrictor muscle of the throat.

In this respect I have often noted after the most painstaking surgical tonsillectomy, where a history of retrotonsillar abscess is present, that infection may remain latent for years. An acute exacerbation of a transient infection may reveal a pocket of pus extending to the aponeurosis of the constrictor muscle. Sometimes in the case of discrete tonsils buried deeply in the muscle, a fistulous tract may require ablation in order that total eradication of an overlooked focus may be accomplished. Electrosurgery is the method par excellence for correcting any of these annoying complications following classic operations.

To understand occurrence of hemorrhage we must consider the anatomy and physiology of the tonsil from an electrosurgical point of view. The tonsil is highly vascular. It receives its blood supply from at least five branches of the external carotid artery. It is this vascularity which suggested the rationale of a "double-checking technic" to control postoperative bleeding. The modified coagulation technic was first inaugurated to completely control bleeding. It was later that I clinically noted that patients complained less of the pain following coagulation, after the application of the monoterminal electrode both deeply and superficially.

### Technic of Modified Coagulation

The patient having dissolved two butynamidopyrine lozenges on the tongue and being thoroughly swabbed with 2 per cent pantocain solution is ready for electrosurgical treatment. Rarely will the pharyngeal reflex require further anesthetization. Depending upon the size of the tonsil, from five to six applications of the biterminal or double tipped electrode are made to cover the entire organ to the depth of one millimeter and spaced one millimeter apart. The tip of the electrode is always pointed toward the center and away from the plical folds. Coagulation should never approach the highly sensitive capsule and the reflected plical folds closer than is absolutely necessary. Desiccation by a monoterminal electrode now follows. The pointed, angulated needle is placed through the coagulum to the depth of at least one millimeter and never more than two. The current from the Oudin terminal is now employed to maximum heat tolerance. The patient decides just when the heat generated in the tissue is sufficient to thrombose any larger vessels which may not have been sealed during the coagulation process. Four to six such applications usually suffice to completely control primary and secondary bleeding. The same monoterminal needle electrode is now used for fulguration. Sparking is obtained by keeping the tip of the electrode at a slight distance from the tonsil. The entire area of the tonsil is sprayed with this short spark. The resultant coagulum becomes dried and much more friable, and does not separate as a foul, sloughing mass. It will become detached as a relatively dry mass almost unnoticed while the patient gargles with an astringent solution.

As noted, coagulation causes a complete destruction of cell walls and nuclei; the tissue becoming a homogeneous, hyalinized mass. Desiccation is confined more to the needle tip and shriv-

eling of cells and nuclei is evidenced. Fulguration completes the dehydrating process superficially and is most advantageous in sealing the smaller vessels and lymphatics, thus preventing metastasis and undue absorption of any of the toxic end-products of tissue combustion. Should one of the larger vessels remain patent during coagulation, it is the purpose of desiccation to thrombose this vessel at the margin of the coagulated area. It is important to restrict the heat generated in the tissue to a white, nonadherent coagulum. Cauterization or charring of tissue must be avoided.

As previously demonstrated[4] absorption of the end products of electrocoagulation is provocative of an "immunity reaction." This reaction continues after each treatment as long as infection exists in the tonsillar crypts and is independent of the amount of coagulation. The virulence of the invading organism determines the severity of the general response or autogenous vaccine reaction. When the infection is either attenuated or eliminated, as is usual after the fourth treatment of each tonsil, there is rarely a general or grippe-like reaction. Fulguration, though sealing the lymphatics and inhibiting the non-specific protein reaction, does not interfere with the absorption of the end-products of bacterial destruction. It is this absorption, of necessity, which accounts for the unabated vaccine-like reaction which affords the patient so much relief of both subjective and objective symptoms. I have often observed[5] and recorded the rapid disappearance of cervical lymph node enlargement, both in the tuberculous and non-tuberculous infections, following the first few applications of surgical diathermy. Infection is either attenuated or eradicated prior to the total extirpation of the tonsil.

## Newer Electrodes

To avoid inadvertent injury to adjacent structures, the electrodes have been insulated with hard rubber throughout the entire shank. The tip alone is left exposed. The angulation of both biterminal and monoterminal electrodes is carefully insulated so that no damage is done to the posterior pillar when the needle is aimed at the anterior portion of the tonsil. The tips of the biterminal electrode are properly blunted to enable the operator to more accurately estimate the depth of coagulation. This is of especial importance when the capsule is reached. Unless, as has been noted above, there is a history of peritonsillar infection, the capsule should be left *in situ*. The fibrous capsule then acts as a barrier to invading organisms. The monoterminal electrode used in fulguration and desiccation employing the higher voltage Oudin current has been lengthened to 13 cm. This permits the shank of the needle to be inserted into the chuck handle outside of the buccal area and so to prevent sparking of tongue and lips.

## Effects of Modified Coagulation

A connotation of the principal effects of modified electrocoagulation is appended:

1. Desiccation seals vessels left unthrombosed by coagulation. Larger vessels at margin of coagulum require extra heat.

2. Fulguration seals lymphatics superficially, prevents undue absorption of toxic products of combustion and minimizes reaction.

3. Prevention of postoperative adhesions. Pillars and plical folds are left dry and nonadherent.

4. Dehydration of coagulum. Extreme dehydration makes possible the detachment of the coagulum as a fine powder imperceptibly while the patient gargles.

5. Sloughing of coagulum is avoided.

6. Malodor and bad taste are avoided when dehydration is thorough.

7. Definite relief of pain due to coagulation is noted. Counter heat of desiccation and fulguration apparently lessens afferent nerve impulses.

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# PHYSICAL THERAPY IN ALLERGIC DISEASES *

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AND

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The treatment of allergic diseases by physical means assumes a rôle of importance only when it is pursued conservatively by careful methods. In most instances physical therapeutic methods are more of an adjunct than a mode in allergic therapy. There is no set physical procedure or routine for the treatment of asthma, hay fever, and allied conditions.

We must keep in mind that allergic patients are usually highly nervous, very active individuals with a hypersensitivity to any form of external stimuli and may react untowardly to any or a group of physical agents. The allergic symptom complex may at times be entirely due to physical agents. Individuals of this group have been designated cases of physical allergy. They have to be handled with extreme caution because of their intense hypersusceptibility to physical phenomena, such as light, cold, heat, and other factors found in our environment and in life.

In the past five years more work has been done on physical therapeutic means in allergic disorders than in any previous period. Allergists have long been familiar with the fact that following an intercurrent acute infectious disease allergic manifestations subside, at least temporarily. To produce therapeutic fever in allergic patients with nonspecific protein is fraught with great danger because of their extreme reactivity.

## Diathermy in Asthma

With this in mind, Feinberg and his coworkers, in 1931, produced fever in asthmatic patients by diathermy. A low voltage, current of 3,000 to 4,000 milliamperes was used. One-half to four hours were usually necessary to produce the desired fever. Their results are encouraging but they thought it very essential to stress the importance of a careful medical and allergic study before such a procedure is tried.

A later and more complete report by this group showed that fever therapy of this type was very efficacious in obtaining relief at times in some refractory cases. Leopold and Stewart, of Philadelphia, and Miller and Piness, of California, in 1931, also published reports of cases treated by a similar diathermy apparatus. Their results were questionable and both groups felt that a more exhaustive study of the subject should be made before any definite conclusion is reached.

We have had experience with this type of therapeutic fever in five cases and feel, as do many others, that there is some other factor present in accidental fever of a simple or complex physicochemical nature that is not obtainable in mechanical fever *per se*. In all fairness it is observed that the majority of this work has been done on refractory cases of intractable asthma that had not responded to the routine methods of accepted therapy.

Unpublished reports of cases in our files show that some temporary beneficial effect is obtainable from diathermy applied locally to the chest of asthmatics. Increased expectoration of the typically tenacious mucus followed the application and the patients were given marked relief. One of the most difficult problems in treating an acute asthmatic paroxysm that has run the gamut of spasm, edema, engorgement and profuse secretion of mucus, is how to liberate this material. We have found local diathermy of benefit in certain individuals, especially in the bacterial cases with long standing fibrosis and compensatory emphysema.

X-ray, infrared, and ultraviolet irradiations have been used with varying success. H. Biancani, in the French Medical Review, in 1932, stated that x-ray over the entire

* Read at the Thirteenth Annual Session of the American Congress of Physical Therapy, Philadelphia, September 13, 1934.

lung has been beneficial in a few cases. He has also used it over other sections, as the head, spleen, liver and endocrine system. We have studied the effects of the roentgen ray on the adrenals and observed the possible increase of adrenalin-like substances in the blood. No prolonged clinical change was noted.

Ultraviolet irradiation, outside of its general systemic effect, we believe to be of little use in bronchial asthma. Cases of persistent urticaria have at times responded to this form of therapy. At present we have under observation three cases of urticaria, two children and one adult, that seem to improve with the quartz light treatment. Urticarial eruptions are so capricious and variable that we do not advocate it in all patients, but we feel that ultraviolet gives relief in some cases.

**Hypersensitivity and Physical Therapy**

Duke describes two types of physical allergy: The contact and the reflex forms. In the former the reaction is confined entirely to the exposed areas, and in the latter a general or systemic reaction is noted in other parts. These cases of so-called "physical allergy" may occasionally have some of the most violent manifestations. Erythema, edema, pain, swelling, and even severe shock have been present at times. Some of the patients that we have had the opportunity to observe, have also had a hypersensitivity to other substances, such as inhalants and ingestants. It is far easier to desensitize a patient to these than it is to bring about the same response to treatment of a physical hypersensitivity.

Gradually increasing exposure to or contact with the offending agent is the method of therapy. No one is more qualified than the physical therapist to subject a highly sensitive patient to the effects of light, cold and heat. Duke has outlined a very complete method and procedure for treatment of hypersensitivity to external, environmental physical factors.

The opinion of our group has always been that it is well to refrain from the use of local applications in the nose during the hay fever season. If any local treatment has been given by us, it has been very bland and non-irritating. Several preparations on the market today are quite acceptable and efficacious in some cases of severe nasal block, coryza, and conjunctivitis.

Great interest has been manifest in a desensitization of the mucous membranes of hay fever sufferers by ionization. H. C. Warwick, in a preliminary report and later in a more detailed essay, has outlined this process. The method is described at length, and we refer you to the original for the procedure. We have been in contact with a small series of cases treated by this method and feel that more observation is needed before we can give a definite opinion.

It is our impression that the method of choice in the treatment of seasonal hay fever is desensitization by extracts of the pollens to which the patient is sensitive. In a large series of cases, over a long period, this method has been very effective not only in the relief of hay fever, but in the treatment and prevention of other allergic manifestations. The longer desensitization is continued the more efficient the treatment becomes.

Allergic symptoms are manifold and strange. Any membrane or skin surface of the body may act as a "shock organ" to manifest a hypersensitivity to a certain atopen. In the order from head to foot we mention migraine, conjunctivitis, hay fever, laryngeal spasm, asthma, abdominal pain and other gastrointestinal manifestations, bladder irritability, angiospasm, urticaria, angioneurotic edema, and eczema. All of these conditions may be allergic. The pathologic picture in all is practically the same — spasm, engorgement, edema, and increased permeability of capillary walls.

There is a lack of balance in some system or systems. A lack of sympathetic and vasomotor tone is manifest. In allergic individuals the whole glandular and nervous mechanism in a great many cases is "out of tune." We believe that one set or routine method of therapy is impossible in any of the allergic diseases. The treatment in each case is individual.

**Summary**

Physical therapy has proven most valuable in preserving and restoring general resistance, that most important adjunct to success in allergic therapy. Many cases of all types of allergy have been benefited and no doubt cured by physical means, but by and large, the most important rôle of phys-

ical therapy in allergy is the tonic and systemic effect. At the present time we are unable to state exactly the definite indications for treatment by physical means for each type of allergic disease.

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## Discussion

**Dr. Norman Titus** (New York): Dr. Wilmer spoke of hay fever. I think it proper to bring to your attention that our procedure is to get patients to come a month before the 15th of August. We give them ultraviolet irradiations with the mercury arc lamp, starting with a minute and increasing up to ten minutes. We increase the time by a minute every day. When the season comes on, we use a nonvacuum electrode in the nose for ten minutes, five minutes on each side. We follow that with a quartz applicator of the Kromayer lamp on each side of the nose for one minute.

One must remember that the patients are sensitive around the nostrils. It is important to use a foot switch as a means of giving them confidence in the current, and to test the current on our own lips first at the base of the electrode so that they know it will not burn the inside of the nose. If the patients are going to sneeze they follow the instruction to take the foot off the switch and in that way avoid sparking around the nostrils.

Strange to say, we have found that this technic will keep patients free from symptoms. Each treatment gives immediate relief for 48 hours. If treatments are given every other day, they will secure considerable relief.

In 1922, I published a paper stating I had evolved a theory that each millimeter of the mucous membrane had an immunity up to 10 units. The ordinary wear and tear was 7 units. When the pollen came along, it threw the demand away over 10 units and the patients developed symptoms. When we use ultraviolet in the nose, we sterilize the mucous membrane 5 units, and the extra load doesn't make it more than 10. The symptoms are abolished.

I stated that ultraviolet light is germicidal in the nose, and that theory was accepted. I received communications from England saying that it was the right theory concerning hay fever. Last year I read a paper on erysipelas, showing that the theory was erroneous. I am a firm believer now that ultraviolet light is not germicidal.

We have tried this treatment at the Vanderbilt Clinic. We took 100 cases from the Allergy Clinic that did not react to vaccination. Dr. Stevens selected the worst cases and those receiving no relief. We treated those patients after the 15th of August, without giving them the preliminary course of ultraviolet irradiations. The treatments were continued throughout the month. The report we got was that 97 of those cases could be considered clinically cured during that season.

As to angioneurotic edema, I call special attention to static currents which will cause the edema to disappear quickly. I had one patient who was on the stage. Every time she did a certain kick in a dance she would get a knee full of fluid preventing reduction of her fever. With this treatment the edema disappeared quicker than is attainable by other methods. I have treated different parts of the body and have removed the edema by one treatment with a static discharge.

Some day we will find that there is a chemical action performed in the skin by ultraviolet light which is largely linked up with the whole subject of allergy.

**Dr. Alexander Clark** (Philadelphia:) Allergy is defined as an abnormal response to a normal contact. That is absolutely the reverse of our ordinary form of disease production. Ragweed pollen is a perfectly normal constituent of the nasal mucous membrane of the inhabitants of the North American continent.

If we want to accomplish anything on the treatment of an allergic condition, let us stick to hay fever, which has already been brought up. First of all, we can remove this normal contact in any case by sending the hay fever patient to Europe. There is no ragweed pollen in Europe. However, that is an expensive method, out of the question, of course, for the majority of sufferers.

There is another method that tends to reduce its severity, and that is pollen injections. Another method is so to change the individual that he will no longer exhibit this abnormal reaction

to the normal stimulus. This latter method of treatment was the treatment that had been used in allergy for generations. Everypody had a favorite remedy for asthma and hay fever. Recently studies have been made of all possible manifestations of allergy without pronounced success. The most successful of all has been removal of abnormal contacts which, in a great many cases, are trifling. A person can get along without feather pillows, or a cat or a dog around the house, but we do not make that person normal.

We have methods that are aimed at changing the individual so that he will no longer exhibit allergy. That has been the method which physical therapists have tried and are trying in various ways. A person may be in absolute health and yet have during the hay fever season a severe attack of hay fever. The stronger and healthier a normal individual is, the worse his hay fever is likely to be. We have to change him fundamentally if we are to obtain a real cure.

There are a number of conditions producing a profound effect on allergy which are quite within the realm of physiotherapy. The first of these is simple inflammation. In these days a great many individuals go bathing with the upper part of their arms exposed. Normal skin reaction in those cases disappears entirely. The person has the skin reaction before he gets sunburn, and he has the skin reaction after he gets sunburn, but while his arm is sunburned there is no reaction at all. Another condition which obscures the allergic picture is pregnancy. A woman who is pregnant often loses her hay fever. She will have it before and after but during pregnancy she is not allergic.

Inflammation is the very factor that gave impetus to fever therapy. That therapy has not been as efficacious as naturally produced inflammation. If an asthmatic develops pneumonia he remains for quite a long period symptom-free. Simple fever does not produce an inflammation. In pneumonia the inflammation is in the lungs and they no longer exhibit the ordinary allergy. Of course, later the asthma recurs.

I strongly urge that it pays to consult a colleague trained in allergy. If there is one thing that the allergic patient is noted for, it is the variability of his symptoms. I have seen an asthmatic, for no reason at all, become entirely symptom-free for two or three months and then have his asthma return.

In reporting any new method of treatment I think everybody should get sufficient data before going into the treatment and certainly before going into print with an expensive apparatus for ionization. There are thousands and thousands of hay fever victims in the United States, and it is very easy to get ample statistics on any number of hay fever patients. Any hay fever clinic will be only too glad to take advantage of a new type of treatment and will provide all the cases one may wish.

**Dr. Harry Bond Wilmer** (Philadelphia): This subject is individual with each patient and it is almost impossible to definitely lay down any hard and fast rule for the treatment of any group of cases.

There should be a much closer association between the physiotherapy and the allergic departments of hospitals. We are dealing with an entity we know nothing about. In the true sense of the word, we have the cart before the horse. We do not know what the real cause is. Something very successful in the treatment of this condition may, however, emanate from the physiotherapy department.

## New Instrument to Measure Light Intensity Developed

A new, simplified instrument for measuring precisely the intensity of light has been developed by Prof. Parry H. Moon, of the illuminating engineering department of Massachusetts Institute of Technology.

Known technically as an alternating current bolometer, Prof. Moon's instrument is so sensitive that it will measure the light from distant stars but will have its chief use in research on the various forms of lamps and lights in the field of illumination.

The bolometer is a small instrument looking exactly like the ordinary vacuum tube in a radio set. Inside the tube is a small piece of blackened metal known as the "target." When light falls on the target, its blackened surface absorbs some of the heat present in the rays. This heat change, while minutely small, is sufficient to vary the nature of the tiny alternating current flowing in the tube. Measurement of the change is made possible by an alternating-current amplifier, similar to those employed in radio sets which have been brought to a high state of technical perfection.

Prof. Moon's new bolometer overcomes some of the older handicaps encountered in working with research in light measurement. Its chief advantage is that it dispenses with high-sensitivity galvanometers demanding delicate laboratory technic.

In addition, older devices developed slight differences of temperature when two different kinds of metals were connected in the measuring circuit and false currents were set up. These false currents, like parasites, attached themselves to the true current being measured. This condition is not experienced with the new instrument.

The theory and design of the apparatus was worked out by Prof. Moon. W. R. Mills, Jr., student in his department, constructed the instrument. — *Science News Letter.*

# PHYSICAL THERAPY IN FRACTURES

V. W. MURRAY WRIGHT, M.D., F.A.C.S.

PHILADELPHIA

Fractured extremities when immobilized undergo changes characteristic of any part which is put at rest — atrophy of disuse. In addition to atrophy, fibrosis frequently occurs when soft issues are traumatized.

The period of immobilization in fracture cases is often the shortest part of their disability. Prolonged disability following the removal of casts or splints is frequently due to the continuation of age old treatment in these cases. Past treatment has consisted of splinting fractured bones sufficiently long to be absolutely sure of advanced callus formation, reliance being had on the x-ray instead of the clinical aspect. Splints should be discarded when clinical union occurs, and not according to a fracture time-table. Each and every fracture should be treated according to definite indications.

When fractured extremities are immobilized for months when weeks should suffice, or for weeks where days should be sufficient, there is almost sure to be poor local circulation, atrophy of disuse, and fibrosis. When these conditions are present prolonged and arduous physical therapy often fails in completely restoring function. It is much better for us, let alone the patient, to prevent atrophy and adhesions than to treat them after they have taken place. Motion prevents the formation of fibrous tissue.

Physical therapy should be used early, rather than late, in the treatment of fractures. We are now teaching that physical therapy should begin before a fracture is reduced rather than after solid bony union has taken place. This may sound radical, but it is conservative treatment because it keeps muscle and soft tissue in a normal state. This is preferable to permitting tissues to undergo pathological changes which eventually have to be corrected. Accordingly it is the older form of treatment which should be regarded as radical rather than the advocated procedure.

As is well known, pain and irritation in an extremity lead to muscle spasm. Unrelieved muscle spasm leads to stiff muscles and joints, which in turn, prolongs return of function. By preserving muscle relaxation through proper early physical therapy we avoid the necessity of having to correct these complications.

An interesting example of muscle spasticity has been related to me by a surgeon. While doing gymnastic work, a young man slipped on the gymnasium floor. As he rose the surgeon noticed that the man's wrist showed deformity. Immediately examining it, he discovered an angulated fracture of the lower radius. He could move the lower fragment back and forth with the greatest ease and without any pain, so that the patient did not realize that he had sustained a fracture. The muscles were very flaccid. The fracture was immediately reduced and emergency splinting applied until they were able to proceed to a nearby hospital. By this time (one-half hour or more) the muscles had become spastic, the patient was suffering, and motion was decidedly painful.

Early physical therapy in the treatment of fracture presupposes cooperation between surgeon and physical therapist.

Unfortunately most surgeons do not seek cooperation of the physical therapist. Many surgeons delay too long in sending a fracture case for physical therapy, and then with a brief note — "Please give some physical therapy."

To obtain better results in fracture cases, to shorten the period of disability, and to return the worker to his job in the shortest time consistent with his health, we must treat these patients differently than we have in the past. In private practice, the best physical therapy is that which is administered by the attending surgeon. He is more familiar with the fracture pathology and immobilization requirements, and is best able to judge what type and how much physical therapy is advisable.

In dispensaries and wards the best results are obtainable where a trained physical therapist is at the surgeon's elbow when dressings are inspected or changed. Treatment carried out in this manner gives the patient the advantages of consultation and individualistic care.

Lucas Championière, in 1889, obtained bet-

ter results than his colleagues, and better results than some do now by the early use of physical therapy. He used a simple, practical method — heat, friction and early motion. These are still available today. He had no means of applying infrared or ultraviolet rays, diathermy, sinusoidal, galvanic currents, or other of the more modern agencies, but he had his head and his hands. These are all that any of us need for preserving or restoring function. They may be used in any home, office, ward, or clinic.

Massage and friction are often confused. Friction is only gentle massage. It is comparable to the caressing stroke of a fevered brow and is equally as soothing and relaxing. Carefully administered, it may be used before or as soon as a fracture is reduced and constantly afterwards. Friction improves the circulation, locally, and thus promotes early healing while preserving soft tissue tone. Heat accomplishes the same, but in a different and in a lesser degree. Early motion prevents adhesions and maintains function. Gentle heat and gentle massage are twin benefactors of injured tissues.

With these simple or practical physical agents the surgeon or physical therapist can early obtain excellent results in fracture cases. When open splints rather than casts are used, friction may be applied by the patient at home. It is a simple task to teach the patient to stroke his fractured wrist, say three times daily for five minutes, and to use an electric pad for an hour each morning and night. In this way he can obtain 21 treatments a week, which is better than half an hour once a week, even though it be administered by an expert. We must teach the patient to help us heal him.

Motion must be instituted just as soon as it is safe to do so, which is sooner than is usually believed. Many do not think of motion until the fractured part has been removed from its splints. Actually it may be initiated as soon as the fracture is reduced, except in fractures which are oblique, spiral, comminuted, barely engaged, or compound. As soon as clinical union is evident, judiciously performed motion is perfectly safe. Active motion should include all normal movements of the injured part, to prevent limitation of motion in particular anatomical areas. Accordingly we will produce flexion in fractures about the elbow joint, abduction and rotation in fractures of the humerus, flexion, extension and grasp in wrist fractures, supination and pronation in forearm cases, and the like.

On the other hand certain errors must be pointed out; such as applying a solid plaster cast about an impacted Colles' fracture in an elderly patient for six to eight weeks; immobilizing an impacted fracture of the head or neck of the humerus, in an elderly patient, for six to eight weeks; applying a solid cast for two to three months to a fracture of either or both malleoli where the x-ray shows the fracture is incomplete or impacted. Such fractures are difficult to mobilize, if at all, even when considerable physical effort is used under general anesthesia. If then it is impossible to break up an impaction, or to move an incomplete fracture, how can the patient do so with only guarded active motion. Obviously, prolonged immobilization in such cases is not only unnecessary but harmful. A short period (two to three weeks) of immobilization suffices to overcome the results of the attendant soft tissue trauma. By applying open splints instead of casts the part can early receive physical therapy, which results in an early anatomic, functional, and economic recovery.

Restoration of function, after splints have been removed, is hastened immeasurably by teaching the patient suitable exercises, which he may perform at home for a definite period of time and at stated times during the day. Directions should be given specifically such as: "Squeeze a sponge in hot water for five minutes three times a day."

A simple way of restoring function is to teach patients to educate their muscles to recover motion which has become limited. Every fracture case results in at least some temporary limitation of motion. This should be determined and then motion instituted to overcome it.

Some examples of such simple and practical exercises are:

1. Flexion of fingers and restoration of grip — carry a small soft rubber ball around and squeeze it ten or more times every hour. Immerse an ordinary sponge in hot water three times a day and squeeze it for five minutes. Hold in the air by its corner, a sheet of newspaper or a handkerchief and slowly crumple it with the injured hand only, and until it is compressed into a small object in the hand. Give a child a water pistol and it will achieve flexion with glee.

2. Flexion and extensions of the wrist — sit in front of a small table and let both forearms rest on its top with both hands just projecting over the farther edge. Then lower and raise both hands together using the well hand as a standard. This should be done three times a day at least, for increasing periods (one to five minutes) until normal motion is achieved.

3. Pronation and supination — fix both elbows against the body with the forearms and hands projecting straight out from the body. Turn both palms downwards and then toward the ceiling. Grasp a poker or a broom handle in its middle and alternately twirl it right and left. Bend down and grasp a partly filled water pail and after lifting it a few inches from the floor spin it right and left. In the two latter exercises centrifugal force aids the actively initiated pronation and supination.

4. Flexion and extension of the foot — sit with the leg extended and the heel resting on the floor. Tie a bandage or cord about the big toe. Pull up with the cord and then press down actively. The other foot may perform the same motions as an example of normal motion.

These are a few illustrations of exercises which any one can devise. Impress upon the patient that since he is incapacitated because of his injury he has nothing to do — except to get well and that he can do this quickly by helping himself and following your instructions.

The moral effect on the patient, too, cannot be overrated, for generally a patient so managed becomes an enthusiastic "assistant" to his surgeon or physical therapist.

These represent problems of a nature not germane to our study.

## TECHNICIANS' EXAMINATION

The American Registry of Physical Therapy Technicians announces a written and practical examination for Senior and Junior Physical Therapy technicians to be held Thursday, January 16, 1936, at 8 A. M., in the Los Angeles County Medical Association Building, 1925 Wilshire Boulevard, Los Angeles, under the supervision of Dr. John Severy Hibben. Only those whose applications have been accepted by the Registrar will be permitted to take these examinations. An announcement elsewhere in this issue gives all information as to how to obtain applications.

# ARCHIVES of PHYSICAL THERAPY, X-RAY, RADIUM

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# EDITORIALS

## SHORT WAVES AND SELECTIVITY

Few other procedures in modern physical medicine have passed through the gamut of extreme opinion as hertzian short wave radiation since the affirmation of its therapeutic and selective action. This has been especially apparent in the contemporary literature in America where its therapeutic possibilities were not only foreshadowed, but where every opportunity for leadership in this field was fumbled in a most inglorious manner. Seldom have protagonists and antagonists been more sharply aligned against each other and waged a more persistent polemic, with most of the verbal cannon directed at the concept of its selective action. This emotional partisanship in the field of scientific medicine deserves no sharper reminder of its retrogressive influence than that science is classified knowledge which is always obtained by quantitative evaluation and not by ratiocination.

Reasoning from analogy or from a will to believe or disbelieve, many well intentioned but over conservative individuals have seen nothing more in short wave radiation than a new and expensive method of infrared therapy for venal exploitation. Surely medical science is old enough to bring home to all the oft repeated lesson that neither an unfounded enthusiasm nor an uncritical negativism should have place in any problem of a scientific nature. Enthusiasm is undoubtedly a valuable asset in any human endeavor, provided it rests on a sound basis, unfettered by prejudice or preconceived notions. Negativism too, is an asset provided it is supportable by unquestioned evidence. The difficulty with some phases of the entire range of short wave therapy is that the laboratory has been selected as the sole authority by some writers for claims which at first blush appear unreasonable and even physically impossible. Naturally others of a skeptical bent of hind have totally or partly rejected many claims without first having submitted them to the crucible of critical and unbiased investigation. Admitting that laboratory tests are not conclusive so far as their effectiveness in clinical application is concerned, and that both the test tube and the bedside must be utilized for the determination of the value or lack of value of any and every therapeutic procedure, even this combined research must be predicated upon uniformity if pitfalls are to be avoided.

It is especially in this field that apparently similar or even like investigations by different men have resulted in entirely op-

posite findings. Thus negation of proclaimed data has been the consequence. When other impartial investigators have undertaken the task of establishing how such a diversity was at all possible, it was seen that both sides were apparently in the right because each worked along different lines. It is a well known scientific fact that in checking the laboratory finding of investigators one of the principle conditions to be exacted is a careful duplication of every measure, procedure and technical step utilized in the original investigation. In our field this unfortunately has not been complied with, with a result that well directed efforts have not only not been supported but antagonized.

Actually, the basic difficulty has been a distrust of the term "selectivity" on the ground of its newness, its mystical implication and the recollection of the classical Dessauer-Hulthausen imbroglio of the former's untenable theory of the selective action of x-radiation. Omitting further reference to Dessauer's "point heat theory," the selective and point heat action associated with ultrashort wave influence have been explained and pointed out by authoritative workers abroad and confirmed by equally authoritative students in America. The brilliant and pioneer labors of Pätzold,[1] Pflomm,[2] Schliephake,[3] abroad, and of Pratt and Sheard,[4] and Bachem[5] in America, have perhaps contributed greater weight to the elucidation of this still debatable problem than all of the affirmations and negations voiced in contemporary literature. Of the explanation received from communications by various students regarding our confused state of knowledge about selectivity, Bachem[6] has contributed as succinct and plausible a view as is commensurate with present information on the entire subject. He states:

> Selective heating by ultrashort waves is the different heating of different substances at identical conditions (volume, shape, $\gamma$, intensity, time, etc.). For the determination of this selective heating a certain volume much larger than the thermometer is required.
>
> Point heating is the different selective heating of the two or more constituents of an emulsion or other fine mixtures. While the thermometer registers an average temperature, the actual temperatures of the component constituents may differ considerably. So could bacteria be killed by heat while the measured average temperature of the whole emulsion is lower than their lethal temperature.

Dessauer assumed that x-rays and other short wave rays heated one out of thousands of atoms, disintegrating this directly and the others indirectly. This theory is discarded for the following reasons:

> Heat is the kinetic energy of irregular molecular motion; the term cannot be applied to a single atom.
>
> X-ray absorption does not ocur in isolated atoms, but rather uniformly along their path.
>
> X-rays affect the electronic structure of the atoms, thus altering their chemical properties and producing direct chemical effects.

In summarizing the opinions of continental workers, Schliephake[7] has pointed out that the selective effect on the smallest elements depends on the following factors:

> The amount of the heating in the condenser field is regulated by the wavelength in relationship to the conductivity and the dielectric constant of the object. It is also possible, by altering the wavelength, to heat certain electrolytes more strongly than others. That human tissues also behave differently toward an eletcric field, and that they are influenced unequally by different frequencies, has already been demonstrated. . . . The behavior of bacteria to different wavelengths belongs especially to this category.

Proof for the above opinion is not wanting and was an early impression of pioneers and more recent investigators. It will be recalled that shortly after Schereschewsky[8] had pointed out the striking action of certain frequencies upon tumors in rats, which for lack of experience he suggested to be a specific action, Christy and Loomis[9] confirmed a caloric parallelism in their own, and Pflomm,[2] and Ritter,[10] in subsequent studies. In all these observations, the induced sarcomatous growths apparently receded and even disappeared when only the very lowest range of ultrashort waves were used. No matter whether this effect was misinterpreted as due to a specific action inherent in a certain range of frequency, or to a pure caloric reaction, or a selective phenomenon, it is clear that there took place an intensification of biologic processes that was perhaps associated with point heating which resulted in the discovery of an irrefutable fact.

Esau[11] extended the concept of the unusual action of condenser currents of short wavelengths by pointing out a selective heat action when non-living material was subjected to its influence. He reported that when an emulsion of an aqueous solution containing an electrolyte ($Na_2CO_3$ in paraffin oil) was made to heat up to the point of explosive heating, during this state the

temperature of the mixture ranged only between 50 to 80 degrees C. This same paradox of boiling at that low pointed value has also been shown to follow when oil and alkalinized water are superimposed in layers in a test tube and subjected to the influence of ultrashort waves. Here as in the observation above, a duplication of the boiling phenomenon takes place only in the aqueous layers, while the stratum of oil remains relatively cool.

Even though test tube experiments may be regarded only as significant, they nevertheless, carry certain therapeutic implications that cannot be dismissed until the evidence in that direction has been critically and intelligently evaluated. Although selective heating may be a *sine qua non* of certain frequencies in a condenser field, it may not be amiss briefly to consider the theory of its evaluation. It is now generally conceded that short wave radiation acts on the smallest particles of the dielectric and attacks the minutest particle containing electrical charges. It may influence the ions distributed in the solvent, depending on the concentration and the electrolytic dissociation of the solution. It may come about from dielectric displacement — acting on the polarizable charges in the molecules, or, as pointed out by Schliephake:[12]

> . . . the loss of energy in the dielectric, by means of which the conduction current components are enabled to work. The ions are subject to a power drag in the direction of the field. They become extraordinarily rapidly moved to and fro by the electric field force, and in this way we get conduction current. Thus heating of the dielectric is brought about.

Actually physicochemical changes have also been brought about with practically no change in the temperature, indicating that selective action may also be produced without caloric manifestation. Under a constant temperature régime, Recknagel and Schliephake[13] carried out numerous experiments on colloids in human serum and showed that the viscosity may be influenced to rise or fall. Studies by Wilke and Müller[14] on various forms of colloid material showed that the effects were always dependent on frequency and even upon the intensity of energy. They noticed momentary changes in cataphoresis and conductivity, in flocculent precipitation and viscosity. Szymanowsky and Hicks[15] were able to detoxify diphtheria serum under the influence of a 2-meter ultrashort wave field. Izar[16] showed that a 20-minute exposure to wavelengths of 4, 8, 15 m. increased the non-specific anticompliment power of normal and syphilitic serum, the increase varying inversely to the wavelength.

Where heating has been the sole basis for the proclamation of a selective factor, we find that Pätzold[17] was the first to establish an experimental basis for our present knowledge of the effect of various frequencies on electrolytes. His work has since been confirmed by various investigators, all having agreed that maximum heating in substances with a dielectric constant ($\epsilon$) and conductivity (K) only takes place when the wavelength ($\lambda$) stands in a certain relationship to both these magnitudes. Selective heating unquestionably takes place *in vivo* and follows a parallel course in living material. The evidence is preponderantly in favor of this view, but unfortunately it is scattered in small foreign publications of limited circulation that their influence has been as the voice of passive protest against the more auditory negations in larger publications in our land. Bachem's[5] confirmatory contribution presented elsewhere in this issue is therefore timely. The facts have been marshalled in orderly fashion and presented with scientific precision. By concise exposition and also illustration it was demonstrated that frequency plays a rôle in selectivity, so that even between the short ranges of 3 to 15 m. distinct thermal changes are noticed to ensue in human material. Under strictly identical conditions variable heating was observed in electrolytes of different conductivities and biologic material when exposed to ultrashort waves of different frequencies. For instance, with a five meter wave the "relative heating took place in the following order: Fat, bone marrow, bone, lung, skin, spleen, liver, hair, brain, muscle." Since the circulation of the blood is an important method for heat transportation, it is interesting to again read the confirmatory evidence that it is also influenced by frequency to the extent that it assumes a gradient where blood corpuscles are heated more, and blood serum less than the whole blood.

In the light of present knowledge it is reasonable to assume that selectivity and its interpretation on a clinical basis must play

a more important rôle wherever radiathermy will be indicated. It is also reasonable to assume that even with our present knowledge, crude though it be, when viewed from the point of active interest and newer contributions that are already more than foreshadowed in this discipline, more precise therapeutic indications will develop in which selectivity will be considered as a primary if not a specific effect of short wave radiation. The hertzian spectrum of electromagnetic radiation holds out tremendous opportunities requiring but the diligent efforts of modern science to classify and adapt, to insure greater therapeutic usefulness.

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## THANKSGIVING AND PHYSICAL MEDICINE

The last Thursday of November is an American national holiday of profound sentiment and meaning. It originated in 1621 at the Plymouth settlement in New England as an expression of gratitude to the Deity for the first harvest. President Lincoln, in 1863, made it a national holiday by proclamation, and so deep a root did it find in the hearts of all true Americans that succeeding Presidents have annually renewed the festival proclamation.

Though religious in expression the observance is fundamentally based on human emotion entirely free of any theologic dogma or tenet, so much so that all citizens and strangers in our midst irrespective of creed or race can share in the festival wholeheartedly and without any mental reservation. Indeed, the spirit of the festival should not be egocentric and its ethical aspect should embrace a feeling of good will for our entire nation. While, in common with the rest of the civilized world we have not been spared the hardships incident to an almost universal economic depression, we as American citizens, physicians and especially as physical therapists have ample reason to pause in our labors to reflect with gratitude on the good that has been our share during the present year.

As citizens we should be grateful for our democracy which insures every honest man an equal opportunity to live in peace and honor. We have been spared the sad experiences of other nations who have suffered at the hands of ruthless and irresponsible demagogues. We, in America, have not been caught in the eddy of fantastic political isms and have continued to enjoy the rights, privileges and immunities guaranteed us by the Constitution of our land. We must be thankful that our wise and benevolent government has kept us out of the bitter strife so widespread in Europe,

Asia and Africa. We know not what it is to be persecuted for political or religious convictions nor for the accident of racial membership.

As physicians it has been our good fortune in spite of threats of socialization to be permitted to pursue our vocation in an atmosphere of freedom and in a spirit of equity. As physical therapists we have especial cause for gratitude that our struggle for recognition by our own craft and by the world at large has come to an end. Physical therapy today takes equal rank with all other legitimate and recognized disciplines of medicine and surgery. We have to thank Organized Medicine, as embodied in our American Medical Association and its Council on Physical Therapy, that we have been accorded its seal of approval and wholehearted support. The Congress has grown in membership not only quantitatively but qualitatively. The ARCHIVES, its official organ, is daily gaining in subscribers and in international prestige. And we must be thankful that we have in our inner circles men who in addition to being imbued by the highest moral and scientific ideals, have also the will and the ability to carry on labors, the fruits of which will add to the benefits of Medicine to suffering humanity.

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## Scientist Discovers Way to Predict Your Life Span — Age at Which Hardening Lens of Eyes Makes Difficult Acommodation for Reading Betrays Normal Lifetime

One of the dreams of science, discovery of a way to predict how long an individual will live — if not claimed by murder or other untimely death — was announced to the National Academy of Sciences.

A key to an individual's normal span of life, long or short, is carried with him, heretofore unrecognized, in his own eye, Dr. Felix Bernstein of Columbia University revealed.

The aging process of the human body, he reported, can be measured easily by taking note of the change when the lens of the eye becomes less elastic, some time during middle life. Most persons become aware of the change at the age of 45 or 50, when the hardening lens can no longer make sufficient accommodation for reading. If this aging-process, called presbyopia or "old-sightedness," occurs early, the individual's normal span of life is comparatively short. If it occurs late in middle age, the individual can expect to see a venerable old age, unless some infection or accident cuts short his natural lifetime.

Dr. Bernstein told how he has reached his conclusions after systematic investigation of this means of measuring the aging process, carried on both in Germany and this country.

"Data on 5,000 cases of presbyopia," he said, "gathered from the University clinics of Goettingen and Leipzig by two students from my Institute in Goettingen and from two private oculists, and followed individually from the first tests until death, proved that presbyopia is correlated with the duration of life in such a way that the early presbyopes die early and the late presbyopes die late."

Brainstroke and heartstroke were the causes of death in the persons who proved the significance of the eye change. These accounted for about half the 5,000. The rest of the patients died of cancer, pneumonia, or other diseases, and for these the research workers could find little or no correlation between the time of the eye lens hardened and duration of life.

Reporting a further experiment under a grant from the Rockefeller Foundation given to the Biological Laboratory at Cold Spring Harbor, N. Y., Dr. Bernstein concluded:

"This shows conclusively that the physiological aging, measured by the range of accommodation is strictly hereditary. Our former conclusion that the natural length of life may become predictable if a proper measure of the physiological aging has become available, is strongly backed by these findings."

Stressing the significance of the discovery for heredity, Dr. Bernstein said:

"These implications of natural span of life are especially important in regard to the fact that the natural causes of death come more in the foreground the more the infectious diseases are brought under control. The span of life in the future will be determined much more by that which Francis Galton called 'the treasure of inheritance' than by conditions which lie in the environment." — *Science News Letter.*

# SCIENCE, NEWS, COMMENTS

## November Meeting New York Physical Therapy Society

The New York Physical Therapy Society held its regular November meeting, November 6, 1935, at the New York Academy of Medicine. The paper of the evening was read by Dr. *Harry E. Stewart*, entitled: "Diathermy — A Useful Adjunct in the Treatment of Pneumonia." The discussion was opened by Drs. *Jesse G. Bullowa* and *W. P. Anderson*.

## Cosmic Rays Deflected in Strong Electric Fields

A new method of analyzing cosmic rays — by deflecting them in intense electric fields — has been achieved by Dr. Ernst Lenz at the Physical Institute of the Technical College, Stuttgart, Germany, (Nature, Nov. 24). Dr. Lenz is a pupil and colleague of Prof. Erich Regener, world-famous cosmic ray authority.

If cosmic rays consist, in part, of electrical particles such particles should be deflected by both strong magnetic and electric fields. The deflection by magnetic fields has long been known but hitherto scientists have had difficulty in detecting the electric field deflection.

Using three Geiger Müller counters to line up the axis of a corpuscular cosmic ray and a fourth counter to measure the angle of deflection, Dr. Lenz found that fields of 700 volts per centimeter were capable of deflecting the weaker and softer rays about four-tenths of an inch.

Very intense electric fields of 70,000 volts per centimeter were necessary to deflect the most penetrating rays. For the soft rays the displacement indicated a preponderance of particles bearing a positive charge of electricity. The strong, penetrating rays, however, showed a preponderance of particles carrying a negative electric sign.

From the deflection observed, it was possible to estimate the energy of the weak and strong components of the cosmic rays. The weak particles possessed an energy equivalent to 10,000,000 electron volts and the strong, penetrating energies of 2,000,000,000 volts.

The new method, Dr. Lenz indicates, "is considerably more convenient for the investigation of cosmic radiation than the use of magnetic fields."

With publication of reports from Germany it is revealed that research at the Bartol Research Foundation laboratories has been directed along similar lines in the past.

Prof. W. F. G. Swann, director of the Bartol laboratories, when informed of the achievement at Stuttgart, pointed out that in April, 1933, he and Dr. W. E. Danforth, Jr., reported to the National Academy of Sciences preliminary results of similar work. — *Science News Letter.*

## Mother's Milk Found to Check Hemorrhage

Mother's milk has a very special power to hasten the clotting of blood and therefore to control hemorrhage or bleeding, Prof A. Solé reported recently to the Vienna Association of Physicians.

Curiously enough, animal milk does not have the same power to clot blood nor does colostrum, the preparatory milk secreted by the mammary glands during the first day or two after the birth of a baby.

Boiling the milk destroys the blood-clotting property, as the active substance, whatever it may be, cannot withstand heat. But the human milk may be dried and an extract of the powder used to check bleeding. This extends its usefulness, since a supply can be kept on hand for use when fresh human milk is not available. — *Science News Letter.*

## Anti-Anemia Substance Isolated From Liver

A substance which appears either to be, or to contain, the long-sought active chemical principle in liver — responsible for the wonderful effect of liver in regenerating blood in pernicious anemia — has been isolated by Drs. H. D. Dakin and Randolph West of Presbyterian Hospital, New York.

Dr. George R. Minot and Dr. William Murphy of Harvard Medical School first showed the value of liver as a remedy for this previously fatal disease. The nature of the haematopoietic, or blood-producing factor in liver has, however, hitherto remained elusive although many scientists have been on its track. Drs. Cyrus H. Fiske, Y. Subbarow and Bernard M. Jacobson of Harvard Medical School, at the meeting in Atlantic City, N. J., of the American Society for Clinical Investigation, announced apparent progress in this research.

The substance now reported by Drs. Dakin and West is obtained from liver extract by a highly specialized process of precipitation. It has been tested clinically on a considerable number of patients of the Presbyterian Hospital, and the large majority of cases have markedly responded to it.

In one of a number of similarly satisfactory cases the count of red corpuscles had increased from 0.9 million to 2.1 millions and the proportion of the special kind of blood cells called reticulocytes had increased from three per cent to twenty-eight per cent on the twelfth day after the beginning of treatment.

The substance is given by injection; it appears to be of proteid character, there being thus a tendency for its chemical nature to be changed — and its potency decreased — by digestion if administered by mouth.

With the proper caution of research workers, Drs. Dakin and West point out that the available evidence seems to be actually against the view that the

substance which they have isolated is of a single chemical nature.—*Science News Letter,* September 14, 1935.

## Dr. A. R. Hollender Guest Speaker

Dr. A. R. Hollender addressed (by invitation) the Detroit Otolaryngological Society, Wednesday, November 20, on the subject "The Scope of Physical Therapy in Otolaryngology."

## New Kind of Ether Acts Faster; Recovery Is Easier

A new kind of ether, faster-acting and with few or none of the unpleasant after-effects of the familiar ethyl ether, is being used in a few selected hospitals throughout the country to ease the pains of mothers during the birth of their children, to bring quick, easy oblivion for teeth extractions, and for many other surgical procedures.

It was made-to-order at the request of a scientist who wrote its name and chemical formula and predicted its usefulness as an anesthetic before it actually existed. Other important figures in the dramatic development of the substance are two Canadian physicians who made human guinea pigs of themselves to test its safety, and some five hundred patients in Philadelphia hospitals and over three hundred mothers, in a Montreal maternity hospital, whose records testify to its value.

It was Dr. Chauncey D. Leake, University of California professor of pharmacology, who figured out with pencil and paper that a substance known to chemists in theory only and which conbined the structural characteristics of ethyl ether and ethylene would be a good anesthetic. The substance is divinyl ether, to call it by one of its several chemical names.

The human guinea pigs who gave it its first human trial were Drs. S. Gelfan and I. R. Bell of the University of Alberta. These dauntless scientists put each other to sleep with it before daring to try it on patients.

Before that, Dr. Leake and associates in San Francisco, following established scientific custom, tried the new anesthetic on laboratory animals, mice and dogs. They found, as they had expected, that it put the animals to sleep more quickly and easily than ether or ethylene and that they came out of the anesthetic more rapidly and, generally, with less nausea or other complications. There were no significant harmful effects on the various organs. Divinyl ether puts human patients to sleep in a minute and a half and they come out of the anesthetic within two or three minutes. A great advantage to the surgeon is the fact that it is better than other common general anesthetics for relaxing the abdomen without paralyzing the muscles between the ribs which are part of the breathing apparatus.

However, in reporting the new anesthetic to the American Medical Association he stated that divinyl ether is not the ideal inhalation anesthetic. For one thing, it is explosive, and for another, it may prove expensive to use. Then, too, it may decompose with the appearance of such dangerous irritants as formaldehyde and formic acid.

Dr. Leake hopes that further study of the theoretic action on the body of various chemical combinations, such as led to the development of divinyl ether, will some day produce a more nearly perfect or even the ideal general anesthetic.

Its advantages are such that they think it will probably have a definite place in the field of anesthesia. Because there is very little vomiting and the patient recovers quickly after divinyl ether, the scientists think this new anesthetic is particularly suitable for extracting teeth and minor operations after which the patient can be up and about.

Careful tests of the effects of divinyl ether on the liver of dogs showed that this anesthetic does not disturb the liver to any appreciable extent, Dr. Wesley Bourne and Douglas W. Sparling of McGill University reported to the Congress of Anesthetists. It has been given to over three hundred patients at the Royal Victoria Maternity Hospital in Montreal to vanquish the pains of childbirth. From observation of these cases, Drs. Bourne and Sparling reported that the new anesthetic seems particularly suitable for this purpose. They find it not a suitable anesthetic for laboratory dogs. — *Science News Letter.*

## Rhubarb and Seaweed Rival Spinach as Vitamin Sources

Spinach, traditional rebellion-rouser at the younger generation's dinner table, now has rhubarb and seaweed as rivals in its rôle of vitamin source.

At the meeting of the American Chemical Society, Prof. E. R. Norris and Mary Simpson, of the University of Washington, reported on their investigation of the vitamin content of seaweed. Seaweed is used as food in various parts of the earth, they pointed out, and indirectly it serves as a vitamin source for all the fish and other animal life of the sea. It is therefore of practical importance to know that several species of seaweed, including those commonly used as human food, are at least fair sources of the scurvy-preventing vitamin C, and also contain vitamin B.

Results of research on spinach and rhubarb were presented in a joint paper by Dr. D. K. Tressler and G. L. Mack of the New York State Agricultural Experiment Station, and Dr. C. G. King of the University of Pittsburgh.

Spinach is not just spinach, their investigations showed. When it is raised in upland gardens it contains about 50 per cent more vitamin C than is found in spinach raised on muck land. Also, how long it has been on the market is a matter of considerable dietetic importance, for when held at ordinary room temperatures it loses half of its vitamin C in three days and practically all of it in a week. This difficulty can be overcome by chilling, however; spinach kept in a good refrigerator showed very little vitamin C loss. Age at harvesting was not found to be much of a factor, nor was there any significant difference in vitamin content between different named varieties of spinach. The vitamin was found practically altogether in the leaves; very little was present in the stems.

Rhubarb was found to be untemperamental,

physiologically. Its vitamin C content was practically constant, regardless of state of maturity. Neither was there any notable difference between the two garden varieties tested.—*Science News Letter.*

## Value of Infantile Paralysis Vaccine Held Doubtful—Brodie-Park Method Termed Safe But of Uncertain Value—Kolmer Vaccine May Even Cause the Disease

Vaccination of children against infantile paralysis by present methods is of little or no value in protecting the children from the disease. One type of vaccine may not even be safe.

This is the opinion expressed by Dr. Thomas Rivers of the Rockefeller Institute, New York, and Dr. James P. Leake of the U. S. Public Health Service, at the meeting of the American Public Health Association. These two authorities discussed reports of infantile paralysis vaccination presented by Drs. Maurice Brodie and William H. Park of the New York City Health Department Laboratories and Dr. John A. Kolmer of Temple University, Philadelphia.

The Brodie-Park vaccine was characterized as safe but of doubtful value in protecting children from the dread paralytic disease.

Dr. Kolmer's vaccine was described as being dangerous and of doubtful value. "I don't believe Dr. Kolmer's vaccine is safe," Dr. Leake declared. Dr. Kolmer himself admitted that eight persons given his vaccine subsequently developed infantile paralysis. He believes this is because they had already become infected with the causative virus before given the vaccine. Dr. Rivers, however, disagreed, basing his opinion on study of the reports of the cases, time of exposure and also on the type of vaccine used.

Dr. Kolmer's vaccine is prepared from the infantile paralysis virus by passage through monkeys, and other treatment a process which he believes reduces the infective property of the virus, leaving it capable of stimulating the body's natural defensive forces to resist the disease. This method of weakening the virus has not been proved to be safe, in the opinion of Dr. Rivers and of Dr. Simon Flexner, former director of the Rockefeller Institute. The safety of such a weakened virus is assumed but not proved, Dr. Rivers stated.

The Park-Brodie vaccine is prepared from killed virus. It is safe, apparently, but Dr. Rivers questions its protective value. However, he hopes that this safe vaccine will be tried on a large number of children so that its value or lack of effectiveness may be determined beyond doubt. Dr. Brodie explained later that he and Dr. Park expect to continue their work for at least another year. They believe that their vaccine gives susceptible children a small amount of resistance to the disease and they hope this amount is enough to "give them a boost" that will see them safely through one or two exposures to infantile paralysis, by which time they may acquire the natural resistance to the disease that many children have without any vaccine. — *Science News Letter,* October 19, 1935.

## Millikan Frames Platform on Cosmic Ray Truths

Dr. Robert A. Millikan, of California Institute of Technology, told teachers at the American Association for the Advancement of Science at Pittsburgh just what can be believed about cosmic rays, which he called "the energy-bullets" with which the superbandits of the universe are shooting up our earth.

He made it clear that he had abandoned an earlier belief that all of the cosmic rays are "birth cries" or signals of atom-building or matter creation in the far depths of the universe. Scientists as yet can not suggest how the higher energy cosmic rays are created.

For the benefit of teachers who should "instruct and develop rather than to excite or mislead their pupils" Dr. Millikan wrote a platform for the cosmic ray "party."

You may believe about cosmic rays:

Article one states that the penetrating power of cosmic rays coming in to earth from beyond the Milky Way is six to a hundred times that of the gamma rays of radium so useful in cancer treatment and industry.

Article two states that the cosmic rays come from beyond the Milky Way, the part of the universe in which we live. Dr. Millikan ridiculed the idea that they originate in the stratosphere "which has apparently become to the public a solvent of all riddles, a kind of cosmic Houdini in the performance of the miraculous."

Article three states that the energies of cosmic ray charged particles rise to the very large energies of at least six billion and probably more than ten billion electron volts, which is "one of the most amazing facts of modern physics." This is some four thousand times the energy of the most powerful radiation from radium here on earth.

Article four says we can speculate on how the cosmic rays are formed in the depths of space but that we should as yet believe nothing.

Article five says that at present believe nothing about just what is the composition of the cosmic ray bullets. All scientists admit that at least part of the bullets are electrically charged particles. The big question is whether there are also in the incoming rays some photons or gobs of superlight.

Article six states that both the long known negative electrons and the newly discovered positive electrons, named positrons, are shot off when the heart of an atom is hit by the great energy of cosmic rays.

Article seven states that scientists know the fate of these positrons flying out of the collisions between atoms and cosmic rays. They disappear by combining with an ordinary electron and thus create a mild-mannered radiation that scientists have detected.

The present craze for the new was condemned by Dr. Millikan. If this demand for novelty regardless of the true, in art, science, society and government goes much further, "the remedy may

be found in the prospect that a nugget of sober, uncolored truth may become the most exciting news there is just because of its rarity."

"I venture the prediction," said Dr. Millikan, "that our present age, because of its craze for the new regardless of the true will be looked back upon by our children's children with more amazement and ridicule than we ourselves feel because of the credulity of the Middle Ages or the smugness and hypocrisy of the Victorian Age." — *Science News Letter.*

## Leaders of a Community May be Psychopathic Types

Leaders, followed and even revered in their time, are often "the most bizarre of the psychopathic types" of the period in which they live. Dr. Ruth Benedict in her illuminating ethnological study "Patterns of Culture" (Houghton, Mifflin Co.) does not exempt some of these personality patterns which have played important parts in American development.

"The Puritan divines of New England in the eighteenth century," she writes, "were the last persons whom contemporary opinion in the colonies regarded as psychopathic. Few prestige groups in any culture have been allowed such complete intellectual and emotional dictatorship as they were. They were the voice of God. Yet to a modern observer it is they, not the confused and tormented women they put to death as witches, who were the psychoneurotics of Puritan New England. A sense of guilt as extreme as they portrayed and demanded both in their own conversion experiences and in those of their converts is found in a slightly saner civilization only in institutions for mental diseases. . . . .

"In our own generation extreme forms of egogratification are culturally supported in a similar fashion. Arrogant and unbridled egoists as family men, as officers of the law and in business, have been again and again portrayed by novelists and dramatists, and they are familiar in every community. Like the behavior of Puritan divines, their courses of action are often more asocial than those of the inmates of penitentiaries.

"In terms of the suffering and frustration that they spread about them there is probably no comparison. There is very possibly at least as great a degree of mental warping. Yet they are entrusted with positions of great influence and importance and are as a rule fathers of families. Their impress both upon their own children and upon the structure of our society is indelible. They are not described in our manuals of psychiatry because they are supported by every tenet of our civilization. They are sure of themselves in real life in a way that is possible only to those who are oriented to the points of the compass laid down in their own culture.

"Nevertheless a future psychiatry may well ransack our novels and letters and public records for illumination upon a type of abnormality to which it would not otherwise give credence. In every society it is among this very group of the culturally encouraged and fortified that some of the most extreme types of human behavior are fostered." — *Science News Letter.*

## High Blood Pressure Relieved by Surgery

New hope for successful surgical operation in combating the menacing disease of middle age — high blood pressure — has been reported to the meeting of the American College of Surgeons.

Surgical aid for relieving the ailment which brings to a halt many ambitious careers before the prime of life is over will not work for all types of high blood pressure, said Dr. Alfred W. Adson of the Mayo Clinic, Rochester, Minnesota, who described the new operative technic.

Over a period of five years, he added, however, the form of high blood pressure known as essential hypertension has been treated by operations in thirty-five cases. Tried for these 35 people, the operation was in some cases a successful measure taken only after all routine medical practices were applied and found wanting.

The operative technic, still not wholly perfect, consists of cutting nerves which control the contraction and dilation of blood vessels in whole areas of the body. — *Science News Letter.*

## Pacific Physical Therapy Association Meeting

The regular October meeting of the Pacific Coast Association was held October 23, in the Hollywood Hospital, where the following program featuring Fever Therapy was presented: 1. "Physiology of Natural and Artificially Produced Fevers." By *W. E. Macpherson,* M.D., Professor of Physiology, College of Medical Evangelists, Loma Linda, California. 2. "Fever Therapy in Syphilis of the Central Nervous System." By *James J. Cecil,* M.D., Patton State Hospital, Patton, California.

Discussion: *D. R. Drury,* M.D., Professor of Physiology, School of Medicine, University of Southern California, Los Angeles; *Julius R. Scholtz,* M.D., Los Angeles General Hospital, Los Angeles; *F. M. Hebard,* M.D., Rancho Los Amigos, Hondo, California.

## Isadore Maurice Leavy
### (1889-1935)

The Congress regrets to announce the untimely passing of one of its members, Isadore Maurice Leavy, a man who was a creative worker in the field of physical therapy. Dr. Leavy served with honor in the World War and at the time of his death was in charge of the Physical Therapy Department of the Montefiore Hospital for Chronic Diseases. He was a member of many medical organizations, including the New York Physical Therapy Society, lived in Lynbrook, New York, and died at the age of 46 on October 7 of pneumonia at the Mount Sinai Hospital. His many friends offer condolence to his family.

## George E. Page
### (1874-1935)

The Congress deeply regrets to announce the sudden passing of one of its new members, Dr. George E. Page, of Elk River, Minnesota.

# THE STUDENT'S LIBRARY

NÉODIATHERMIE Á ONDES COURTES. (Short Wave Neodiathermy.) By Dr. *Henry Bordier,* Professor of the Faculty of Medicine of Lyon, and *T. Kofman,* Sc.D., Assistant in Biophysics, University of Lyon. Pp. 139 with 55 illustrations. Paris: Librairie J.-B. Baillière et Fils, 1936.

This book by the noted French physical therapist, written in collaboration with a brilliant young physicist, is one of the smallest but also one of the weightiest monographs on the important subject of Short Wave Radiation and Short Wave Therapy. From the very introduction to the last page of the text one is fascinated by the ease and lucidity of the presentation of difficult problems. French teachers of the sciences are well-known for their ability to teach complicated disciplines in a manner to enable undergraduates to gain knowledge, and Bordier appears to be especially gifted both as a teacher and as an author in the sense of making his meaning clear even to novices. In the foreword and introductory pages Bordier presents an historic sketch of the discovery and development of diathermy in all forms in which the name of d'Arsonval shines as the guiding star. Of the names given to short wave radiation he mentions all that have been proposed, including those in America, but believes his designation of "neodiathermy" to be preferable. The text proper is divided into three parts. In the first (9 chapters) he presents a brief but thorough study of electric oscillations. The second part (4 chapters) takes up the physical properties of short waves, while the last part (3 chapters) is devoted to a critical discussion of the therapeutic uses of the short waves. While in the first part the authors stress apparatus made by French manufacturers, the underlying principles of the physics of short wave energy sources are of course universally applicable. The average physician will, however, be more interested in the second part, which considers among others the bio-physical effects of the waves on electrolytic solutions, the heating effects on the blood and tissues, and, in a special group, their general and special effects on the human body. Most readers will naturally be attracted to the therapeutic part. Here Bordier does not blindly follow the claims of other authors in the diverse countries of the world, but presents his own experiences, failures as well as successes. He passes in review the indications and contraindications of short wave therapy in the rheumatic affections, the arthritides, in inflammatory affections, and those of the head, face, respiratory, circulatory and nervous systems. Special chapters take up certain systemic diseases, (metabolic disturbances, obesity, gout), migraine, asthma, dermatoses and others. Finally he discusses the usefulness of short waves to prevent shock and post-operative pneumonia in surgical practice. Some unusually striking results with this form of therapy are recorded. Photographs are presented of a young boy with the genito-adipose syndrome with a female habitus, with undeveloped sexual organs almost devoid of pubic, in whom in the course of six months a complete transformation has been attained. The second photograph shows the boy to have a male habitus, fully developed sexual organs and an abundance of pubic hair. This and other cases show the value of short wave therapy in endocrone disturbances. In short all interested in the advantages and also the limitations of short wave therapy who can read medical French or can secure a translator should not fail to study this masterly work by one of our most distinguished authorities.

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ELECTRONS ( + AND − ), PROTONS, PHOTONS, NEUTRONS, AND COSMIC RAYS. By *Robert Andrews Millikan.* Formerly Professor of Physics, The University of Chicago, Director of Norman Bridge Laboratory of Physics, California Institute of Technology. Cloth. Pp. 492, illustrated with figures and charts. Price $3.50. Chicago: The University of Chicago Press, 1935.

Previous editions of this work have received such laudatory comments that it is not at all difficult to appreciate this reaction after a perusal of the present text. The volume under consideration is an extension rather than a revision of that all revealing and revolutionary contribution entitled, *The Electron,* a contribution that dealt with some of the newer developments in physics wherein Millikan played such a prominent rôle as to have brought the coveted honor of the Nobel prize. As in the previous work, so in this, the author has reduced an intricate and abstruse subject to a lucid, limpid exposition by introducing an historical background into a theme which ordinarily bristles with formulas and is notably sterile in human interest. It is pointed out in the preface that the present contribution is an outgrowth of the "'Messinger Lectures' at Cornell University and in them still further expanded and brought up to date these 'newer developments'." This, and the fact that the rapid discoveries and the newer advances in physics since 1924 made it necessary to add six entirely new chapters, ("Waves and Particles," "The Discovery and Origin of Cosmic Rays," "The Spinning Electron," "The Positron," "The Neutron and Transmutation of the Elements," and "The Nature of Cosmic Rays") place the classification of this book among the most authoritative contributions on the subject.

By means of the historical method of presentation one is enabled to see the slow accretion of fact upon fact, the details of which are presented in exact quantitative experiments. In the space of 16 chapters and 10 appendices, the author has introduced the latest evidence of the atomic structure of electricity, described the most significant properties of the elementary electrical unit, the electron (its positive and negative phases, the nature of protons, photons, neutrons, and cosmic rays) and the nature of electromagnetic radiation. It is difficult to conceive of a more authoritative exposition and of a more concise summary of this important subject of modern physics. Certainly the chapter dealing with cosmic rays has been presented with the authority of the pioneer whose pen was dipped in the reality of personal experience. It is a vivid exposition having all the descriptive coloring of science that reads like romance, rendered in that rhetorical clarity reminiscent of the writings of Huxley and Tyndall. This book will be particularly appreciated by intelligent laymen, students of physical therapy and physicists.

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RADIUM TREATMENT OF SKIN DISEASES, NEW GROWTHS, DISEASES OF THE EYES, AND TONSILS. By *Francis H. Williams*, M.D. (Harv.). Cloth. Pp. 118 with 12 illustrations. Price, $2.00. Boston: The Stafford Company, 1935.

No other branch of physical therapy has more brilliantly demonstrated the basic value of our discipline than that which concerned itself with the clinical application of the "noblest" of all elements — radium. Contributions in this field have been so manifold and striking as to have convinced a world critical to all innovations of its special therapeutic usefulness. This small brochure lays no claim as an exhaustive review of the subject. Indeed its purpose is rather to abbreviate the information now existing and to present the salient facts of the clinical value of radium to a limited group of affections in which it has proven its great value to the author during several decades of his observation. The long services of the author in the field of radiology permits him to voice his experience with the finality of one who has devoted a major part of his life to this study. The work offers a concise review of the scope of radium in diseases of the skin, eyes, tonsils and accessible growths. The methods advocated include a description of many new instruments devised by the author and different filters to permit absorption of the radium into the soft tissues of the body. The volume is divided into three sections. The first contains four short chapters ranging from a description of the nature and properties of radium to methods of measuring, using and applying radium in diseases of the skin and superficial growths. Section II discusses in several brief chapters the applicability, methods and technic of radium to diseases of eyes and eyelids. Section III contains five equally short chapters which deal with the practical uses of this agent in tonsillar diseases and lymphoid involvement in the throat, and discusses instruments, the relationship of focal to systemic involvements, indications, precautionary and borderline values, and the like. To many readers the advocacy of radium for some of the conditions mentioned by the author will undoubtedly be accepted with hesitancy because it is foreign to their experience. This will and can only be confirmed by trial and the duplication of the methods that have been so convincingly used by Williams. The procedure appeals to one as conservative, effective and worthy of incorporation in the affections described in the text.

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ELECTROPYREXIA IN GENERAL PARALYSIS. By *Leland E. Hinsie*, M.D., Research Associate in Psychiatry, New York State Psychiatric Institute and Hospital; Professor of Clinical Psychiatry, College of Physicians and Surgeons, Columbia University, and *Joseph R. Blalock*, M.D., Senior Physician (Psychiatrist), New York State Psychiatric Institute and Hospital; Instructor in Psychiatry, College of Physicians and Surgeons, Columbia University. Cloth. Pp. 90. Price, $1.25. Utica, New York: State Hospital Press, 1934.

This monograph is an attempt to review and summarize the value of hyperpyretotherapy in general paralysis from the point of view of the action of high frequency current and short wave fields. As was expected the monumental labors of von Jauregg soon gave impetus to refinement of methods and technic for production of fever for relief of many of the diseases heretofore regarded as hopeless, a problem which enlisted not only the interest of many workers in divers fields of therapy, but especially those in the psychiatric branch of medicine. The authors have been notable contributors to the elucidation of the effects of artificial fever, and have been among the earliest pioneers to use electrical modalities to study its sustained thermic effect upon paretic patients. The preface by Clarence O. Cheney presents a terse picture of the aims, needs and present status of electropyrexia in modern medicine. While no pretense has been made to present an exhaustive review of the labors already accomplished in this field, the present volume nevertheless incorporates the most detailed review of the important contributions, their influence upon contemporary medicine and their interpretation. The thesis is grouped into two parts. The first reviews the literature of diathermic electropyrexia, discusses the methods in vogue, its physiologic and biochemic action, the degree of heat required to produce a lethal effect on the treponema pallidum, the histopathologic changes encountered, the clinical and laboratory results, and a resumé of the foregoing discussions. The second part reviews the general and specific action from electropyretic instruments emitting ultrafrequency fields whereat the subject matter is introduced in the light of its historical development. Consideration is given to the type of apparatus most practical and the technic most useful. The clinical data evaluated is based upon material which has been checked both prior to and after treatment, and the results are critically analyzed both from clinical and laboratory findings. The work is a searching and conservative estimation of the place of electropyrexia in modern therapeutics, including a generous bibliography for those interested in collateral reading.

COMMON DISEASES OF THE SKIN. By *S. William Becker*, M.S., M.D., Associate Professor of Dermatology, School of Medicine, University of Chicago. Edited by *Morris Fishbein*, M.D. Cloth. Pp. 283 with 83 photographic illustrations. Price, $4.00. New York: National Book Company, Inc., Copyrights by Doubleday, Doran & Co., 1935.

The author prefaces the observation that dermatology has passed through three eras in its development; the first when skin diseases were thought to be due to internal factors (French school); the second which exploited external factors (Viennese school); and the third which has come to be spoken of as the bacterial era (Unna). The author calls the present era the biological era. He points out that animals with a lower developed nervous system than man are not subject to the large variety of skin diseases of man and that the neurodermatoses (including pruritis — local and general — neurodermatitis, dyshidrosis, urticaria, angioneurotic edema, neurotic excoriations, alopecia areata, vitiligo and other less common skin diseases) should be considered from a viewpoint of "nervous hyperactivity and exhaustion," which is found in these conditions. Diseases of other etiology (infections, infestations, and neoplasms, etc.) are considered with their more specific causative agents. Syphilis is discussed incidentally. The subjects are presented in lecture style, the reader being referred to more extensive texts for collateral reading. The treatment for each disease is considered briefly under one or two up-to-date methods now in use and is augmented by a comprehensive chapter on formulary, giving prescriptions and precise information as to where more uncommon preparations may be obtained. The text contains some interesting cases, and the author is to be congratulated on the detail and choice of his photographic illustrations. This work is recommended to the student of dermatology and the general practitioner, because of its broad view of the subject, and the attempt to present the fundamental background of our etiopathic skin diseases, rather than to consider the multitude of symptoms which arise as a result of it. It is also to be recommended because of the conservative as well as latest information of the accepted forms of therapy used in dermatology. It is not an encyclopedic compilation containing many rare skin conditions, nor a complex consideration of treatment containing the time honored forms of ancient therapy.

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ANATOMY FOR PHYSICAL EDUCATION, DESCRIPTIVE AND APPLIED. By *Linden F. Edwards*, Ph.D., Assistant Professor of Anatomy, Ohio State University, Columbus, Ohio. Cloth. Pp. 656 with 472 illustrations, 263 of which are in color. Price, $7.00. Philadelphia: P. Blakiston's Son & Co., Inc., 1934.

The adage that experience is the best teacher, is exemplified in this text of human anatomy for students of physical education. By observation and anatomic teaching in several universities the author attained the satisfactory experience that special students of anatomy could gain greater knowledge of the subject when the order or presentation was somewhat in contrast with accepted methods in current teaching. No originality is claimed except that of method or order of instruction. It is pointed out that in this study of the human body "the regional viewpoint is stressed. . . . Bone, muscles, articulations, blood vessels and nerves of each region are considered in the order named. . . . In the description of each bone, nothing is said concerning the muscle or ligaments which are attached to the various bony markings, this being omitted in order that the student may gain a clear picture of the skeletal frame work. . . . Muscles of each region are studied before consideration is given to articulations in order that the student acquire a better appreciation of movements of each joint." Finally, a brief review is included of surface and applied anatomy at the end of each chapter. It is gratifying that such a departure from orthodox teachings could result in such demonstrable success as has attended the experience of the author. The book provides a distinctly flexible, orderly and well knit text of value not only to students of physical education but as collateral reading to that large group of students of comparative anatomy, and to physical educators, coaches and physicians in charge of divisions of athletics in modern universities and secondary schools. The work is splendidly amplified by colored and black and white illustrations, a generous bibliography and an index of subject matter. This book should be in the library of every student and physician interested in a simple, concise and popular exposition of human anatomy.

# INTERNATIONAL ABSTRACTS

**Treatment of Sciatica With Histamine Iontophoresis. A. Dzsinich.**

München. med. Wchnschr. **81**:1693 (Nov. 2) 1934.

Dzsinich points out that many investigators believe that circulatory disturbances play a part in the pathogenesis of sciatica. It is believed that a local vascular spasm retards the circulation, and this in turn leads to an accumulation of metabolic waste products. The ischemia and the waste matters irritate the nerve and the surrounding muscles, and painful spasms are the result. On the basis of this theory, Deutsch developed the treatment with histamine iontophoresis, for, if histamine is introduced in this manner, the capillaries become dilated, their permeability increases and the arterioles become dilated by reflex action.

The author decided to try this treatment in patients with true sciatica. A special type of foil was attached to the anode, was dampened and was then applied. The foil was applied at four different sites; first on the gluteal muscles; then on the popliteal fossa, then on the ankle and finally on the antagonistic muscles of the extensor side of the thigh. The negative pole, in the form of a large, flat electrode, was applied to the thorax. The author considers it advisable to employ a battery current. He began the treatment with from 6 to 8 milliamperes, applying the electrode for from three to four minutes to the sites mentioned. The treatment was repeated daily and the strength of the current was gradually increased. Of the thirteen patients treated in this manner, five were completely cured, five showed great improvement, two were slightly improved and one remained unchanged. Chronic cases were less amenable to treatment than the recent cases. The author concludes that histamine iontophoresis is as effective as other physical methods and stresses that the treatment is simpler, short and not unpleasant. — [J. A. M. A. **104**:165 (Jan. 12) 1935.]

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**A New Method of Short Wave Treatment. (Eine neue Methode der Kurzwellenbehandlung.) J. Kowarschik.**

Med. Klinik. **30**:1664, **30**:1698 (Dec.) 1934.

Short waves are applied almost entirely in the condenser field. It is but natural to make a therapeutic attempt of the electromagnetic field instead of the electric field. It is essentially no innovation to treat in an electromagnetic field, as it was established by d'Arsonval 40 years ago. With that procedure the entire body or some parts of it were placed inside of wire coils (solenoids) through which a high frequency current was passed. The author resumed d'Arsonval's idea in his attempt to use short wave therapy in the electromagnetic field. He established that with a 4.8 m. wave also in coils of 6-8 turns, which produced a strong field far superior to condenser fields of equal size when measured from the thermic output. He further asserted that in such a field, metals were heated to a small extent, electrolytes and organic tissues, on the contrary to a very great extent. For that reason it was well adapted for therapeutic purposes.

Kowarschik did not use stiff solenoids. In preparing them he proceeded from a metal bandage in which the part of the body to be treated was enveloped. It consisted of a copper sheet inside of two strips of soft India rubber of a width of 3 cm. and a thickness of 1½ mm. each to avoid skin burns from the emission of sparks.

In order to obtain the distance between the bandage and the skin required for a deep effect, an isolating pad may be inserted. Its consistency should provide for the necessary space of separation. A plate of a thickness of 1-2 cm. made of a spongy or mossy piece of India rubber proved to be the best. For treatment in the solenoid all short wave machines are adaptable provided their energy is sufficient for a treatment in the condenser field. From the author's experiences waves from 15 down to 4 meters may be used therapeutically in the coil field. That treatment does not compete with the condenser method. It is practicable to treat in the coil field facial or labial furuncles, disease of the antrum of Highmore or of the frontal sinus, abscess of the sweat glands in the axilla, mastitis, and the like. For osteomylitis of parts of a limb, for joints of hands, elbows, knees or ankles, of if a whole limb requires treatment, solenoid treatment offers absolute superiority over condenser field treatment.

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**Research on the Character and Application of Electrophoresis. (Studien über Wesen und Anwendung der Elektrophorese.) Helmut Rutenbeck.**

Klin. Wchnschr. **14**:228 (Feb.) 1935.

The author substitutes for iontophoresis, kataphoresis and electroösmosis, the designation electrophoresis. The medicine to be administered is either laid on the respective place of the skin as an ointment, or, if the pure substance is preferred, put on the skin by filter paper saturated with its solution. Then the different electrode is placed on it. The author deviated from applying the usual metal electrodes, owing to the risk of skin burns even with currents of small intensity. He prepares cloth-covered electrodes. The procedure is as follows: On woolen material of a width of 5 cm. strands of copper wire are sewn on in circular form, and connected to the circuit. The wool must be moistened and is then applied closely to the skin, with the wires covered by oil cloth to avoid evaporation. The

electrode is weighted with a sand bag or fastened to the body by a bandage. When short exposures take place with a high current intensity the patients hold the indifferent electrode (prepared as the different electrode) in the hand because of least sensitiveness of the palm to electrolytic disintegration. With sufficient thickness of the wool material covering the electrodes, hardly any corrosions will occur even though the current may flow for many hours. Corrosion is avoided by previous application of chlorhydric acid. Generally a current intensity of about 15 ma. is employed in acute diseases (sciatica, myositis), medium sized electrodes being applied in succession to the different places of the skin according to the size of the pathologic lesion. In those cases the time of exposure was 10-15 minutes. In chronic diseases the author prefers a current of lesser intensity (about 3-5 ma.) even though larger electrodes are used, but then the time of exposure is 6-8 hours every other day.

As a practical application the author mentions histamine electrophoresis. Resorption of effusions and paravenous infiltrations are favorably influenced. Electrophoresis of cholin derivatives proved effective mostly in cases of post-operative retention of urine. Further indications are: Paralysis of the intestine and of the bladder, muscular and articular rheumatism, atonic constipation, hypertony. Electrophoresis combined with alpha-dinitrophenol introduced by Cutting, Mehrtens and Taintner may produce local atrophy of fat. The author has no large clinical material. He was, however, able to record some successes. Electrophoresis with bee-poison (Forepin) proved valuable in sciatica and muscular rheumatism. Electrophoresis combined with vitamines had a beneficial influence on peripheral neuritis.

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**Method of Short Wave Therapy. J. Kowarschik.**

Med. Klin. **30**:1661 (Dec. 14) 1934.

Kowarschik points out that the short waves are used almost exclusively in the condenser or the electrical field, in which case the electrodes are separated either by an air space or by a solid insulator such as rubber. It is suggested that the magnetic, or, expressed more specifically, the electromagnetic field, be employed. The treatment in the electromagnetic field is not new, as d'Arsonval introduced it under the term of autoconduction four decades ago. He suggested that the entire body, or portions of it, should be brought into wire spools (the so-called solenoids) through which high frequency currents pass. Inside of such spools, or coils there exists a magnetic field, the field lines of which run approximately parallel to the axis of the spool. This field produces induction currents in conductors placed in the spool. The author decided to take up once more the idea of d'Arsonval and to try to employ the short wave therapy in the electromagnetic field. He hoped that with a frequency 100 times as great as that which was used by d'Arsonval it would be possible to produce more convincing biologic and therapeutic actions. He describes experiments conducted in trying to devise a satisfactory instrument, reports tests on the heating of stratified material, plants and animals, and finally describes the therapeutic application. The treatment in the spool field is not meant to be an improvement of the condenser method and does not detract from this method. Such disorders as furuncles of the face or lips, disturbances of the sinuses, abscesses of the sweat glands of the axilla and mastitis will still be treated in the condenser field. However, disorders like osteomyelitis, which involve parts of the extremities or disorders of the different joints of the extremities, can be treated more effectively with the solenoid. — [J. A. M. A. **104**:603 (Feb. 16) 1935.]

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**The Treatment of Pulmonary Tuberculosis by Hyperpyrexia. 3. Temperatures that Inhibit Growth of Cultures of Mammalian and Avian Tubercle Bacilli and One Strain of Leprae Bacillus. G. R. Duncan and E. S. Mariette.**

Am. Rev. Tuberc. **31**:687 (June) 1935.

Nineteen cases of pulmonary tuberculosis were treated by artificial hyperpyrexia by means of baths and general diathermy. Sixteen showed x-ray improvement. Two cases have shown no change and one has become worse. The latter was a hopeless type. All the other patients were far advanced and were not doing particularly well before treatment. Seven have had their outlook definitely improved by treatment. One extra-pulmonary case, typed human, had been treated and has shown improvement. One improved by treatment, is now dead as the result of a rupture of an empyema pocket through his lung and cardiac failure. The reason for the selection of pulmonary tuberculosis cases is that the large majority of these cases are of the human type.

Besides the work on domestic animals and patients, the authors offer further experiments with cultures to prove the detrimental effect of heat on growth of the human type of tubercle bacillus. Eight incubators were kept at 96, 98, 100, 102, 104, 106, 108 and 110 degrees F., by the use of thermostats and standard thermometers. Thirteen strains of acid-fast pathogenic bacillus were used in the experiment; five strains of human, five strains of bovine, and two strains of avian tubercle bacillus, and one strain of leprae bacillus. Three cultures of each strain were put in each incubator following transplantation from their respective mother cultures. When sufficient time had elapsed (ten days with the leprae culture to four weeks with some of the bovine strains) the cultures were taken from the incubators and checked for gross evidence of growth. Four of the human and one of the bovine strains were isolated and typed.

The results may be tabulated as follows:

1. All five strains of human tubercle bacillus grew luxuriantly from 96 to 100 degrees F. inclusive; poorly from 102 to 104 degrees F. inclusive; and not at all above this temperature.

2. All five strains of bovine tubercle bacillus grew luxuriantly from 96 to 104 degrees F. inclusive; poorly from 106 to 108 degrees F. inclusive;

and in only one tube out of fifteen at 110 degrees F.

3. The two strains of avian tubercle bacillus grew luxuriantly from 96 to 108 degrees F. and poorly at 110 degrees F.

4. M. leprae (strain 1629, Mulford) grew luxuriantly from 96 to 110 degrees F.

5. Two human strains, incubated for three weeks at 106 and 108 degrees F., were still able to produce progressive disease in guinea pigs. These strains after three weeks' incubation at 110 degrees F. caused no tuberculosis in forty-four days in guinea pigs.

6. The temperature range at which cultures of various types of tubercle bacillus grow luxuriantly closely corresponds to the temperature range of domestic animals in which these organisms produce progressive disease. The temperature range at which cultures of various types of tubercle bacillus do not grow includes generally the temperature range of domestic animals in which these organisms do not produce disease.

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**Adjuvants in the Treatment of Erysipelas in Infancy. Frank C. Neff and George V. Herrmann.**

Lancet **55**:273 (May 1) 1935.

Several years ago one of the authors reported their observations of various measures in the treatment of erysipelas in infants. These include the use of blood transfusion, radiologic and ultraviolet procedures. Of the latter they state that it is interesting to learn that one exposure to the mercury quartz lamp burner may be a sufficient treatment for erysipelas, as recommended in the Cook County Hospital Therapy. Fantus states that the exposure must include the lesion and two inches around it; that the rays must be direct and at a distance of 12 inches; the time for children is graded down below the usual 10 minutes. It is pointed out that other investigators also have recently reported that ultraviolet is the most successful, least dangerous and least expensive; that it is better than serum therapy. Their results in infants are: The untreated case has one chance in three to recover; that one in five die in spite of early treatment; that serum-treated cases have a morbidity of 15 days, while ultraviolet treated cases have a morbidity of 7.6 days. Ultraviolet irradiation is given early and for three successive days. The dose is slightly less than one and one-half erythema-producing, for infants. The sooner it is given the lower the mortality and fewer the complications. According to English observers, ultraviolet causes a leucocytosis in the surrounding skin so that the streptococci may be destroyed when entering this region and the inflammation kept from spreading. Both the healthy and affected regions should be exposed. As high as one and one-half to two times the erythema dose is used in England.

At the University of Kansas City, the infant is exposed for three minutes at 18 inches, over the area of redness and the immediate surrounding border. The treatment is given every day for the period of the infection.

**The Effects of Hyperpyrexia Produced by Radiant Heat In Early Syphilis. With a Description of a Simple Method of Producing Hyperpyrexia. Norman N. Epstein and Maurice Cohen.**

J. A. M. A. **104**:883 (Mar. 16) 1935.

From observations concerning the effects of hyperpyrexia on the lesions and clinical course of early syphilis, it is evident that artificially produced fevers of from 39 degrees C. (102.2 degrees F.) to 40.5 degrees C. (104.9 degrees F.) and maintained for a period of six to seven hours do not sterilize the human body of spirochaeta pallida. This is shown by three clinical recurrences that developed after the hyperpyrexia treatments had been discontinued. The fact that the patients who had strongly positive Wassermann and Kahn tests on entry showed no permanent change after hyperpyrexia would indicate that the infection had not been greatly affected.

The prompt disappearance of spirochaeta pallida from lesions exposed to a high temperature substantiates the view that this organism can be destroyed by temperatures between 40 degrees C. (104 degrees F.) and 41 degrees C. (105.9 degrees F.). If a method could be devised that would raise the temperature of all the tissues of the body to a proper height, the eradication of early syphilis by this means might be accomplished.

A description of a method of inducing hyperpyrexia by the use of blankets alone is included in this report. Its simplicity and the fact that expensive equipment is not needed should increase the availability of this mode of therapy. The treatment given in this way has been less exhausting to the patient than other methods that we have used. The conclusions drawn from this study are:

In thirty-one of thirty-three cases of early syphilis, or 94 per cent, the dark field examination was rendered negative for spirochaeta pallida by means of hyperpyrexia alone. The clinical lesions of early syphilis healed promptly in all cases in which the dark field examination became negative. Three clinical recurrences were observed after cessation of treatment. The serologic reactions were not reversed from positive to negative in any case. Inability to elevate the temperature of all the tissues of the body to the thermal death point of spirochaeta pallida probably accounts for the failure to sterilize the body of these organisms. Hyperpyrexia alone is not a satisfactory method of treatment of early syphilis.

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**Treatment of Gonorrhea In the Female by Means of Systemic and Additional Pelvic Heating. William Bierman and Edward A. Horowitz.**

J. A. M. A. **104**:1797 (May 18) 1935.

A method for intense prolonged heating of the female pelvic organs has been found rapidly effectual in the treatment of gonorrheal infections. A systemic temperature elevation of from 105 to

106 degrees F. is produced by means of pelvic diathermy and photothermy during a period of from one and one-half to one and three-fourths hours. With the use of a special vaginal electrode equipped with a thermometer, the vaginal temperature is maintained between 111 and 112 degrees F. for three and one-half hours. A special arrangement of four dispersive electrodes is necessary. The treatment is painless but there is discomfort from the systemic fever. Constant watchfulness throughout treatment is imperative. An average of less than three treatments caused the complete disappearance of gonococci in nineteen of twenty-three patients treated. In two of the remaining cases the cervix was freed from gonococci after two treatments but not the urethra. In these two cases, coagulation of Skene's ducts cleared up the urethra. A case of cervicitis treated once was not freed from gonococci. In one case a reinfection of the urethra occurred from a persistent gonorrheal proctitis. Patients with salpingitis or arthritis were relieved from pain after one or two treatments. Abnormal discharges rapidly disappeared. Inflammatory masses subsided, but some adnexal enlargement persisted in five of eighteen cases of salpingitis. The treatment is strenuous and patients with cardiovascular or pulmonary disease should not be subjected to it. No serious ill effects were experienced by any of our patients.

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**Death Following Coagulation of the Cervix. Robert I. Hiller.**

J. A. M. A. **104**:1323 (April 13) 1935.

From a survey of the literature, one would gain the impression that coagulation and cauterization of the cervix were entirely harmless procedures. Yet two deaths followed cauterization of the cervix, reports of which have not yet appeared in the literature. In one of these cases a retroperitoneal phlegmon and in the other a generalized peritonitis were found at autopsy. The two cases emphasize the fact that coagulation of the cervix is not entirely without danger, especially if there has been a previous history of septic abortion.

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**Therapy of Arterial Thrombosis of the Extremities (The Therapy of the Cook County Hospital). G. W. Scupham.**

J. A. M. A. **104**:1229 (April 6) 1935.

Care must be taken of cases presenting pain, which may be present with or without lesions, and cases presenting trophic disorders and gangrene. As long as the pain of intermittent claudication is relieved by prophylactic therapy it may suffice. If it does not, or if pain in the toe or the calf becomes constant and independent of locomotion, it should be interpreted as the "trophoprodromal pain", an indication that trophic lesions and even gangrene are imminent and that thorough treatment is required to prevent them. This treatment consists of:

1. Rest in bed, or, at least, complete prohibition of walking or standing for a month or two or even a great deal longer to permit development of collateral circulation and until the pain has completely disappeared. It should be followed by extremely gradual return to partial activity.

2. Hydremic plethora. (a) Ringer's solution. The regular and continued daily drinking of from one-half to one gallon of Ringer's solution is probably a rational attempt at improving the circulation in the threatened tissue, a result that could not be secured by mere water drinking, as salt solutions leave the system less readily than that much water.

(b) Hypertonic saline phleboclysis. In cases presenting a high hemoglobin and red cell count, one might prefer the slow intravenous injection of from 2 to 5 per cent sodium chloride solution, employing 150 cc. for the first injection and 300 cc. for all subsequent injections, given three times a week.

3. Hyperemia treatment. When thermic measures are applied in these cases, it must be remembered that high or low temperatures are borne with impunity only by tissues well supplied by blood. Hence the more the circulation of the limb is interfered with, the nearer the neutral point must be the temperature of the application; especially is this true during periods of phlebitis, acute or recent thrombus formation, or when phlegmons are present. While the treatment should be relatively mild, this should be given for fifteen to forty-five minutes four to six times daily alternating with the postural treatment, so as to maintain the best possible circulatory activity over the greater part of the day and evening.

(a) A lamb's wool and flannel bandage covering of the entire affected limb is the mildest degree of this form of therapy and should be employed in all cases unless more active measures are used, and in intervals between these the limb should be guarded by special care against pressure sores at heel, calf or toes.

(b) An electric light cradle is a more powerful measure when applied as nearly constantly as possible at the temperature most comfortable to the patient. This may range from 95 to 110 degrees F.

(c) Warm compresses are indicated if the skin is dry, extreme heat being scrupulously avoided.

(d) Pyretotherapy may be used. The therapeutic induction of fever is a valuable form of treatment and is employed particularly in thrombo-angiitis obliterans.

(e) Medicinal vasodilators, such as nitrites, are too transient in their effects to be of any value.

(f) Periarterial sympathectomy of the large (femoral) artery may possibly be of value in cases in which there is a markedly vasospastic element, as in Raynaud's disease.

4. Enhancing development of collateral circulation. — Most of these methods are contraindicated in the presence of recent extensive

thrombosis or gangrene, by the presence of phlegmons, or if they produce or increase pain.

(a) Buerger's postural treatment is intended to induce hyperemia. It consists of three periods: (1) elevation for the minimal time to secure blanching of the foot (from thirty seconds to three minutes); (2) the foot hanging down for one to two minutes beyond the time required for maximal redness, unless pain is produced, when the time must be shortened; (3) the horizontal rest position for three minutes or longer.

(b) Contrast baths may be applied up to the knee or the elbow, possibly twice a day, starting with immersion in hot water (not above 110 degrees F.) for five minutes, following this by a dash of or very brief immersion in cold water (not below 50 degrees F.), in alternation several times. The seance is finished by brisk drying after a hot immersion, to insure a good circulatory reaction.

(c) Intermittent compression of the main artery of the limb for one minute and releasing for five minutes, to secure reactionary redness, may be employed.

(d) Short alternations of positive and negative pressure by means of automatic apparatus advocated and devised by Landis and Gibbon and by Herrmann and Reid (passive vascular exercise) is theoretically correct.

5. Analgesia. — Pain not sufficiently relieved by the measures described indicates the use of analgesics.

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**Surgical Diathermy of Carcinoma of the Rectum. Its Clinical End Results. Alfred A. Strauss, Siegfried F. Strauss; Robert A. Crawford, and Herman A. Strauss.**

J. A. M. A. **104**:1480 (April 27) 1935.

While surgical diathermy at first may seem rather absurd after consideration of the brilliant results obtained from the radical removal of the lower portion of the sigmoid colon and the rectum for carcinoma of the rectum, Strauss and his coworkers feel that the excellent results obtained during seven years speak in favor of giving the method a thorough trial for a period of five years more, in which they hope to report a much larger series of cases.

The authors stress the fact that in twenty-two cases excellent results were obtained without colostomy, the patients having full use of the rectum. They advocate the radical and segmental removal of the entire ascending, transverse or descending colon for carcinoma, especially when the continuity of the bowel can be reëstablished and the patient can defecate normally. It is, however, quite another matter to remove the lower part of the sigmoid colon and the rectum and leave the patient with a permanent colostomy opening. While it might be gratifying to the surgeon to demonstrate a series of such cases many years afterward, they do not believe that the patients are happy. By surgical diathermy the rectum can be preserved with its full physiologic function and the patient can live as long, or almost as long, as the one who has a permanent colostomy opening.

The authors are particularly interested in the procedure since it is the first in which local destruction of, or local application to, a carcinomatous growth has produced, clinically at least, a permanent systemic effect. It seems to destroy the toxins which are absorbed from the carcinomatous tissue, this reaction probably being brought about by an intense stimulation of the reticulo-endothelial system. What the substances are that are liberated into the systemic circulation or into the body by the destruction of the carcinoma by diathermy is an interesting subject for further research.

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**Treatment of Hay Fever by Ionization Method. J. A. Hurlbut.**

Wisconsin M. J. **34**:93 (Feb.) 1935.

Attention was first attracted to the ionization method in the fall of 1933, when Warwick used ionization in a group of twelve hay fever patients. The immediate satisfactory relief experienced by many of this group impelled the author to offer it to certain selected patients. Of the forty-five patients treated in the fall of 1933, three patients received little if any benefit. On repeating the treatment, two reported some but not satisfactory improvement. However, the majority of patients were relieved in an entirely satisfactory manner and remained so throughout the season.

Two of the group were physicians who had suffered this affliction for many years and were, at the time of treatment, in a truly pitiable condition. Their immediate relief was such that one is convinced that in certain cases, at least, the ionization method is specific.

To date some 134 ionization treatments for hay fever have been administered and provided relief in a higher percentage than any other method.

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**Study of Effect of Artificial Fever In Hopeless Tumor Cases. S. L. Warren.**

Am. J. Roent. & Rad. Therapy **33**:75 (Jan.) 1935.

Warren states that there is *in vitro* (and some *in vivo*) experimental evidence suggesting a definite "thermal death time" for transplantable animal tumors at high febrile temperatures. There is a distribution of heat by the circulating blood in the febrile state so that the internal organs and tumors in animals, and presumably in man, reach and can be maintained at any predetermined temperature level. This is usually nearly equal to the rectal temperature. On this basis thirty-two hopeless advanced human cases of different types of malignant disease were treated by generalized fever therapy and a combination of fever therapy at 41.5 degrees C. (106.7 degrees F.) and high voltage röntgen therapy. In cases treated previously by high voltage röntgen therapy and in untreated cases, fever therapy seems to have a

definite destructive effect on the tumor cells. The amount of destruction and its duration varies from case to case. Further work on this aspect of the treatment of malignant disease seems to be warranted in the hope of obtaining an additional aid in the treatment of this malady. No results approaching cure have yet been obtained by this procedure. In all cases but three, after the fever treatment there was immediate improvement in the general condition, lasting various periods of time (from one to six months), with gain in weight and strength and with shrinkage of various tumor masses and duration. Evidence of return of growth of the tumors in all patients occurred at various intervals and rates. It was the clinical opinion of those concerned that because of the rapid growth of the tumors and the condition of the patient the probable length of life was restricted (from one to three months). — [J. A. M. A. **104**:1277 (April 6) 1935.]

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**Considerations Relative to the Evaluation of Ultraviolet Radiation In Absolute Units. W. W. Coblentz.**

Am. J. Roent. **33**:793 (June) 1935.

The chief usefulness in rating ultraviolet lamps in terms of their erythemogenic power is because of the ease and simplicity in determining (by physical means) the approximate time of exposure for producing a minimum perceptible erythema upon the untanned skin of average pigmentation, thus, on the one hand, avoiding severe burns, and, on the other hand, preventing the fraudulent sale of lamps that emit little or no short wavelength ultraviolet radiation. This is the viewpoint and the basis upon which the Council on Physical Therapy of the American Medical Association accepts ultraviolet lamps, and is entirely separate from the question of whether the lamps cure disease.

Erythema is not a measure of the curative power of a lamp. But, so long as the present types of lamps remain in use, a knowledge of skin tolerance, as measured by the erythemal reaction, is a necessity in order to protect the patient from burns. Researchers are looking with renewed interest toward the discovery of a biological unit in phototherapy. Coblentz's interest in the subject is in providing fundamental instruments and methods to form a primary basis for standardization of radiation stimuli on an unassailable reproducible basis.

Recently the author has made a portable balanced amplifier and photoelectric cell outfit which can be used for precision measurements in the laboratory and in the field. An outstanding accomplishment of the International Congress at Copenhagen was the recommendation to evaluate ultraviolet radiation stimuli upon a physical (radiometric) basis in absolute units. For this purpose the ultraviolet radiation from the source is to be separated into three spectral bands by means of a non-selective radiometer (thermopile) and a series of three standard filters, copies of which are to be maintained at the National Standardizing Institutes of the respective countries interested.

These three spectral bands, A, B, and C, comprise approximately the following wavelengths: A, from 4,000 A to 3,150 A; B, from 3,150 A to 2,800 A; and C, wavelengths shorter than 2,800 A. To evaluate these three spectral bands Coblentz suggested the use of pyrex, barium flint and Noviol-A filters, which, from previous tests, had been found stable in transmission on exposure to ultraviolet radiation. Since then additional glasses, having similar transmissive properties, made by Schott and Genossen, Jena, have been included in the list.

The evaluation in absolute units is easily obtained by measurements on a black body, or by comparison with a Hefner lamp or, preferably, an incandescent lamp standard of radiation which was originally standardized against a black body. In this connection it is relevant to point out the importance of physiologists and physicians keeping in contact with qualified physicists in their National Standardizing Institutes and Universities, who usually have such apparatus available.